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THE SURVEYS OF JAMES RENNELL, 1764-1777.

PREFACE.

1. Scope of this Memoir.—In 1914 I published a Memoir, accompanied by an Atlas, describing and illustrating in some detail the Survey work of Major James Rennell, F.R.S., first Surveyor-General of Bengal, and later Surveyor-General of India. At the time it was supposed that I had had access to all existing remains of Rennell's work. It transpired that there were, in the India Office, many maps by Rennell which were not included in the lists that were supplied to me originally.

Whilst employed in the India Office in 1916 upon an analysis of the old maps of Bengal, I examined all remnants of Rennell's work contained in the India Office collection, and it is now possible to withdraw the earlier publications referred to above, and to substitute this work, and to illustrate it with a far more exhaustive collection of maps, many of which are now published for the first time.¹

A very complete life of Rennell was published in 1895² by the late Sir Clements Markham.

Sir Clements Markham's life of Rennell did not deal with the technical side of his work. This Memoir deals with that question particularly, but also gives in section VII some of the salient facts of Rennell's life and career.

Previous to 1764, when Rennell first came to Bengal, he was often employed upon Marine Surveys. His charts have long since been superseded by more modern Marine Surveys. Interest in Rennell's Sea Charts is probably limited to their place in the History of Marine Surveys. Beyond giving a list of charts by Rennell still known to exist, this Memoir does not attempt to analyse Rennell's Marine Surveys.

2. Rennell's early work in Bengal.—From 1764 to 1777 Rennell was employed on Land Surveys in old Bengal (now Bengal, Bihar and Orissa and a portion of Assam), and his earlier work was entirely connected with River Surveys.

His first essay was to find the shortest all the year round route of river communication for boats carrying 300 maunds,³ between Calcutta (*via* Channel Creek, some 60 miles below Calcutta) and the main Ganges River.

The orders for this work are contained in Governor Van Sittart's letter to Rennell, dated 6th May 1764, which is transcribed below :—

"SIR,

The first service on which you are to be employed is the Survey of the Great River (Ganges) to the Eastward of Jelenghee; and upon this Survey

¹ To save confusion in the India Office collection, I have given throughout this Memoir full references regarding the whereabouts of the different maps mentioned.

² *Century Series*, 1895.

³ About 11 tons and drawing 2 to 2½ cubits. For draught figure, etc., see *Mem. As. Soc., Bengal*, 1910, Volume III, No. 3, pages 117, 224 and 225.

your particular object must be to find out the shortest and safest channel leading from the great river to Channel Creek or Rangafulla.

For this purpose you will coast along the South side of the Great R^r and examine every Creek or Nulla which runs out of it to the South, tracing them as far as you find them Navigable for Boats of Three hundred Maunds Burthen and informing yourself by enquiry from the Country People whether they are Navigable all the year; of which circumstance may yourself form a tolerable Judgment by the appearance and steepness of the Banks.

You will keep a very particular journal¹ of your Proceedings, noting the appearance and Produce of the Countries through which you pass; the name of every village, and whatever else may seem remarkable, of which Journal you will give me a Copy along with the drafts² you are to make of the Rivers and Creeks.

I am Sir,

Your most obedient servant,

HENRY VAN SITTART."

3. Classification of Rennell's River Surveys.—The very definite character of the letter transcribed above is reflected very clearly in the maps made by Rennell, at least until the end of 1766. During the period 1764-1766 Rennell produced the following main series of river maps:—

- (i) *Ganges Series*.—Jellinghi to the Meghna River. Five hundred yards to 1 inch.
- (ii) *Megna Series*.—Lakhipur to Dacca.
- (iii) *Brahmaputra*³ *Series*.—From near Dacca to just above Goalap in Assam.
- (iv) *The Creek Series*.—Embracing surveys of possible perennial navigable creeks⁴ in the triangle formed by the line Jellinghi Hooghly on the west; the Sea face on the south, and the Ganges and lower Meghna on the east.

The object of the Creek Series is very clear from Vansittart's instructions to Rennell; the inference of the maps of the Creek Series, considered with such collateral information as is available, is that Rennell looked upon the Creek work more as a Reconnaissance than as a definite Survey. Of all the original maps that Rennell made and that are still available, I look upon none with more suspicion than the maps of the Creek Series.

4. Rennell's Land Surveys.—Whilst Rennell was employed upon the work briefly outlined above, his geographical instincts developed rapidly, very soon after he had started his river surveys, he realized how badly off the administration was for good maps of Bengal, and set about collecting material

¹ Rennell actually kept at least two journals. That edited by LaTouche (Mem., As. Soc., Bc., 1910, Volume III, No. 3, pages 95—248), and another in the Orme Collection at the India Office, the latter has not been critically examined. From a cursory examination, I take it to be his *private Journal*, whereas that edited by LaTouche is his *official Journal*.

² Maps.

³ It must be remembered that in Rennell's time the main Brahmaputra ran past what is now Moulmein (Baggonbarry on Rennell's maps).

⁴ A Creek may be taken to be a spill channel, the life of which depended upon the supply of water obtained from a live river. Such creeks are naturally common in a deltaic tract.

to produce a general map of the Province. He soon found that there was insufficient material available to produce such a map ; and he also found that much of the materials at his disposal were misleading and inaccurate. His efforts to produce a reliable map resulted in the compilation of a map of the greater part of Bengal (5 feet by 3 feet) on the scale of 10 miles to an inch,¹ which Clive took home very early in 1767.

From 1st January 1767 Rennell's functions were increased, to include the mapping of the whole of Bengal,² a task which he completed before leaving India finally in 1777.

His system of compilation consisted of using his own large scale river surveys ; similar surveys by the Assistants provided him ; special surveys of uplands, made by the method of route surveys either by himself, his assistants, or by others, whose work, after careful check, was considered sufficiently reliable ; and certain special Marine surveys of the coast line of Bengal. In all 500 such surveys were obtained, and compiled into a map of Bengal, on the scale of 5 miles to one inch, on one large sheet of drawing paper.

This map is lost, but its inconvenient size caused a set of maps on the same scale to be produced, the greater part of which still exist in original.

These maps form perhaps the most valuable original records that are preserved of Rennell's work in Bengal.

An important use to which Rennell's 5-mile to 1-inch plans was put, was the preparation of his small scale Atlases of Bengal and Bihar, on a general scale of about 10 miles to 1 inch. But these Atlases were not produced until after Rennell left India. The first edition of the Atlas appeared in 1779-80, and the second in 1781. A reprint of the latter was issued by the Surveyor-General of India in 1910.

In the analysis of Rennell's work in this report, I have found it impossible to follow exactly the arrangement adopted by the late Sir Clements Markham in the India Office Map Catalogue of 1878. That catalogue merely aimed at cataloguing a very large collection of maps in such a way that any particular map could be obtained at short notice. Thus useful and useless maps became intermixed ; this report aims at sorting out those two types of maps, and arranging them in such a way that their relative values may be gauged with a minimum of trouble ; the report also is necessarily more voluminous than the Catalogue of a Library, because it is automatically a work of reference.

5. Main classification of Rennell's maps.—I have subdivided Rennell's survey results into the following main heads :—

Section I.—General explanation :—

- (i) Methods and types of surveys.
- (ii) Legal value of Rennell's maps ³.

Section II.—Surveys of the rivers of Bengal :—

- (i) Ganges River.
- (ii) Meghna River.
- (iii) Brahmaputra River.
- (iv) Special Surveys of minor Rivers or Creeks.

¹ See Rennell's Diary—Mem., As. Soc., Bengal, 1910, Volume III, Part 3, page 85. This map is not traceable now.

² See as above, page 86.

³ This sub-section is from the pen of Mr. F. D. Ascoli, I.C.S., Settlement Officer of Dacca, and now Collector of Howrah.

Section III.—Special small scale maps.

Section IV.—Renell's 5 miles to 1 inch maps of Bengal.

Section V.—Maps of no immediate value :—

- (i) India and surrounding countries.
- (ii) Small scale maps showing considerable tracts of Bengal.
- (iii) Index or quasi-index maps.
- (iv) Special large scale maps.
- (v) Marine Charts.
- (vi) Other maps.

Section V has been included in case it should occur hereafter that any maps supposed by me to have no practical value should have such a value.

Unless further discoveries are made it may be taken that this Memoir covers the whole of Renell's Survey work in Bengal and his mapping work in more extensive areas.

6. Maps illustrating this report.—To illustrate Sections II and IV of the classification given above two index maps have been compiled. Index map No. 1 refers to the special River Surveys, and Index map No. 2 to Renell's *General* maps¹. No attempt has been made to index graphically the maps of Section V and no index is required for Section III.

¹ Plates 1 to 16 of the new Atlas. The other plates cannot conveniently be shown on this scale and it is therefore thought worth while to print a special index map for them.

SECTION I.—GENERAL EXPLANATION.

PART I.—METHODS AND TYPES OF SURVEY.

7. Two main types of surveying used by Rennells'.—Rennell used two absolutely distinct main types of Survey¹ :—

- (a) River Survey methods.
- (b) Uplands Surveys.

8. River survey methods.—In these Rennell used traverses usually measured with chains and a Hadley's quadrant. From November 21st, 1767, he used a theodolite for angular measurement. Occasional triangulation was resorted to at least across very wide rivers. Details between fixed stations were probably put in by eye, but there is no certainty of this

The above refers to large rivers of which special surveys were made.

For other rivers his methods almost certainly were closely allied to those adopted for upland surveys.²

9. Different types of river plans.—In his river survey work, Rennell used the phrases noted below to denote different standards of accuracy. The actual meaning of the phrases, as understood by me, after a careful analysis of his work, are given in the explanations below :—

“ *Exact Survey* ” means the most accurate work done by Rennell. It is probably very closely reliable if used carefully, and examined critically by those accustomed to compare maps on different scales and of different dates.

“ *Plan* ” may mean an “ *Exact Survey* ” or may not. “ *Plans* ” must be examined carefully to test their accuracy before they are assumed to be correct.

“ *Surveys* ” seem to indicate some departure from exactness, the degree of which depends upon circumstances. Here again exactness must not be assumed without careful analysis.

“ *Cursory Survey* ” means the making of a plan which in accuracy falls between a “ *Survey* ” and a “ *Sketch* .”

“ *Sketch* ” means a map only useful for purposes of general guidance.

“ *Map* ” may mean any standard of accuracy such as falls between an “ *Exact Survey* ” and a “ *Sketch* .”

“ *Particular Map* ” means one compiled in such detail as to afford more particular value in general than such a map as appears in the Atlases published nowadays for general information. Such maps would be more useful for executive as against administrative functions.

“ *General Map* ” conforms to the type of Atlas plate use for broad teaching purposes, or higher phases of administration.

“ *Maps* , “ *Particular Maps* ” and “ *General Maps* ” are generally compilations made from *one or more of the following* :—“ *Exact Surveys* , “ *Plans* , “ *Surveys* , “ *Cursory Surveys* ” and “ *Sketches* .” Thus, whilst there may be no particular difficulty in forming an opinion upon the general standard of accuracy of maps marked in their headings as anything between an “ *Exact Survey* ” and a “ *Sketch* ,” the real value of any one of the different types of “ *Map* ” produced by Rennell is a more difficult matter. The types of survey work used in the compilation of a “ *map* ” may have varied enormously, and before that map is used practically, it is very necessary that its component ingredients be examined.

¹ Apart from his Marine Surveys, with which this report is not concerned.

² For further details, see Section VI of this Memoir.

To facilitate such examination I have included in Section V of this chapter, as complete details as possible to show the sources of information that Rennell drew upon, and their relative values. Whilst the information given is admittedly somewhat defective, it will at least help to give a more accurate idea than has been obtainable hitherto.

It is not possible to say to what mathematical extent any one map left by Rennell is accurate, on the meagre data that has survived.¹ The reconstruction of Rennell's maps from mathematical data is not now possible, and the age of the original maps has naturally emphasized the factor of paper distortion, which is a variable quantity.

10. Comparing Rennell's maps with those of later dates.—To make comparisons between one of Rennell's maps and one of more modern date, it is only possible to take the old map, and by experiment, discover points that are in the same relative positions in the newer map as in the older. To obtain such points it is often necessary to use more than one of Rennell's maps, because, particularly in his river plans, he does not usually include sufficient of the Hinterland to make comparison possible. For this reason, so far as my examination of Rennell's results has made it possible, I have indicated in the case of each map those other maps that should be used with it for comparative purposes. The main difficulty in such comparisons is to decide what particular map can be used to give the best results, and how far, to obtain a comparison initially, it should be subordinated to a generally less reliable map.

This difficulty requires very special emphasis for two reasons :—

- (a) Absolutely rigid comparisons,² such as have been indulged in by many people in the past, can only give proper results by the remotest chance.
- (b) Parties in cases affecting land title sometimes base their claims upon the maps that suit their cases best. There is a school of thought which thinks that should a competent authority require a comparison between a specified old map and one showing more modern conditions, it suffices to make the comparison without any regard to the *intentions* of the original surveyor. In such cases the technical latitude which is the perquisite of the competent surveyor is ignored, usually with unsatisfactory results.

I have referred to these facts here, to be able to outline briefly the attitude which any professional surveyor may rightly assume. If at any time he is given a problem of survey comparison, he must carry out his orders, but if he is satisfied that the work he was asked to do would give better results if he had a very free hand in deciding what material to use, and what to neglect, he should point this out very clearly.

These remarks refer alike to Rennell's River and Upland Surveys.

11. Rennell's Upland Surveys.—Throughout his career in India, for upland work, Rennell was an ardent supporter of route surveys, and considered them sufficient for all ordinary purposes. So far as evidence is available, Rennell surveyed the main routes through a tract under survey, and put in minor routes and the positions of villages, etc., *at a distance from his main routes, from the oral evidence of the local people.*

In most cases the same methods were adopted by assistants closely associated with Rennell.

In mapping a road Rennell would measure its length, and carry out a quadrant or theodolite traverse at the same time. Occasionally important points, such as temples on hills, which were not actually visited, would be fixed by triangulation, usually by bearings, but ordinarily no details except

¹ Such data will be found in odd remarks in Rennell's Diary, and particularly between pages 195 and 234 of LaTouche's edition of the Diary. (Mem. As. Soc., Bengal, 1910, Volume III, Part 3). There are a few other sources from which slight information is available, such as notes or headings included by Rennell in the originals of surviving maps. So far as they are relevant, extracts are included in this Memoir.

² Even the graticule lines on Rennell's maps have been used as bases for comparison for land lying at a distance from the graticules.

those close to a road actually traversed, or a river surveyed specially, can be considered reliable.

Distances on or near selected meridians were checked by observations for latitude, but longitude observations were rare and of poor accuracy.

So far as was possible Rennell used any surveys done previously to his own time, or concurrently, if, after examination, they proved to be sufficiently accurate for his purposes. I have given as many details as are known to exist, of the work of these outside surveyors, in the descriptions of the different maps referred to in this chapter, but I am doubtful if Rennell has left a record of every case in which he used outside work.

For these reasons it is advisable that great care be taken to examine the probable general accuracy of Rennell's maps of a definite tract, before the maps are assumed to be accurate.

Where the terms described under paragraph 9 of this Chapter are used on U land maps, the definitions there described also apply.

12. Reductions from large to smaller scales.—In making reductions from larger scale surveys, to obtain "general" or "particular" maps, Rennell probably used the system of "squares." There is no doubt that his reduced maps are not always closely accurate reductions. Thus, generally speaking, it is better to make use of the largest scale maps available in all revenue cases which require comparisons which affect boundary questions. If a professional surveyor is asked to make such a comparison from a less reliable map than he knows to be available, he should give his reasons of objection. If the demand is persisted in, he should comply, and note the circumstances, very carefully, upon the comparative map that he prepares. If this does not satisfy the applicant for a comparison, the surveyor should decline to have any connection with the case without the orders of the head of his Department or of Government, as the case may be¹.

It is not known if Rennell used a uniform scale of survey for uplands tracts, and if his assistants also used that scale. In some cases a scale of 2 miles to 1 inch was used for field work, but generally, I believe, the field scale was smaller, and, perhaps so small as 5 miles to 1 inch, for at least considerable tracts of Bengal.

It has not been possible to give full references to the statements made above. The sources drawn upon to obtain conclusions arrived at are noted below :—

- (i) Rennell's Journals from 1764-67, and their appendices².
- (ii) Mr. LaTouche's remarks on the Diary on page 4 of his Introduction.
- (iii) Rennell's Memoir of a map of Hindustan, 1783, and succeeding editions.
- (iv) The evidence of Rennell's maps themselves.
- (v) Instructions issued by Rennell to his assistants³.

Perhaps other sources will come to light in the course of time, but at present the above are all that we can draw upon.

13. Technical details regarding Rennell's surveys.—The following information is obtainable from the sources mentioned above and is technically interesting :—

- (a) Latitudes were observed sparingly at first, but from 1766 onwards every few days. (Journals.)
- (b) Magnetic "Variations" (Declinations) were observed very frequently and corrections used to the nearest minute. (Journals.)
- (c) Rennell used a Hadley's quadrant initially; afterwards a land quadrant, and a theodolite (21st November 1767).

¹ Private surveyors always have the option to refuse to do an action which they deem to be unprofessional. I fear, however, that the professional conscience of many private surveyors in Bengal is too weak to withstand the pecuniary loss incumbent upon a refusal to do indifferent work. This is a very regrettable fact.

² Mem., As. Soc., Bengal, 1910, Volume III, No. 3, pages 95-248.

³ A few of these exist in the correspondence of the time in the India Office.

- (d) Chains were used for measuring distances and the chains were sometimes checked (4th June 1764).

The two measures given in the Journals gave chain errors of 6 inches and 8.5 inches.

- (e) Refraction was considered in computing latitudes (Journals), but the latitude of Luckhipur differed by three minutes by two observations.
- (f) Distances were recorded at least to decimals of furlongs (Journals).
- (g) Triangulations across rivers, etc., was used from traverse lines or bases. (Maps.)
- (h) In uplands chain traverses were the basis of the Survey. (22nd June 1765.)
- (i) Bearings to temples were taken to the nearest minute (2nd November 1764); it is not clear how far triangulation was made by means of bearings.
- (j) No orders were issued for the survey of both banks of rivers till 15th October 1764. But it is clear that Rennell, at least sometimes, anticipated those orders.
- (k) Marks were left on the ground at the end of the survey of each length of river, and picked up when the next section was surveyed. (4th November 1764.)
- (l) Peaks fixed in the Garo Hills, 80 miles away, were expected by Rennell to help him in his work later on. (26th October 1765.)
- (m) Rennell relied upon road surveys altogether in his work in North-Western Bengal. (Journals, 1766.)
- (n) Polier's old survey of the Jellinghi is considered good enough for the general maps of Bengal. (9th May 1764.)
- (o) Rennell went to Luckhipur in the hope of getting "some materials" for making a general map of Bengal. (2nd February 1765.)
- (p) Rennell hoped to use Plainsted's Sylhet? maps in the general compilation. (9th January 1755.)
- (q) Rennell refers to some details in his maps being based upon the reports of pilots. (July 1765.)
- (r) Rennell proposes to use Verels's route map to Cospour (in Cachar) in the general map. (February 1766.)
- (s) Rennell thinks of using Plainsted's maps of the lower Megna and the Chittagong Coast in his compilation. (June 1766.)
- (t) Clive ordered a general map of Bengal, in which it would suffice if distances were not exact, but "cursorily" fixed. (10th October 1765.)
- (u) Difficulty found in surveying river banks covered with jungle. (14th July 1764.)
- (v) "The river is fallen sufficiently for showing the exact bed of it, and the further we proceed up the greater we find the fall." From this it may be inferred that many of Rennell's maps do not show the limits of perennial waters. (24th October 1764.)
- (w) Rennell refers to considerable differences between his cursory survey earlier in 1765, of the Brahmaputra to the north of Mymensingh, and an accurate survey then being made. In the meantime some maps of the earlier survey had been sent to the Governor. (26th October 1765.)
- (x) Rennell considered the positions of Sandip and Hatya to be doubtful in (Ritchie's?) maps. (July 1766.) In his final maps the Islands are very much out of position.

These brief extracts might be amplified but it is doubtful if further amplification is needed.

14. The practical value of Rennell's maps.—The practical use of Rennell's maps lies in the following directions :—

- (a) *For Revenue purposes.*—This aspect of the case is dealt with in the next section (Part I).
- (b) *For the study of river changes in Bengal.*—This head may be considered in two phases :—
 - (i) The consideration of changes in small portions of rivers. For such the large scale maps must be consulted.
 - (ii) The consideration of the general subject of river distribution and change throughout the Province. For this the 5-mile maps afford a very useful starting basis of examination.
- (c) *For the study of Physical Geography and Geology.*—The 5-mile maps afford help in both of these subjects.
- (d) *General Engineering and Sanitation.*—Recent changes in level, and their effect upon limits of inundation, etc., may be examined roughly with Rennell's 5-mile maps as starting points.
- (e) *History.*—The maps have a historical value which will probably increase as time passes.

The main importance of Rennell's work in India lies in the fact that his survey, now about 150 years old, was the first that was made of the large area included in index Map No. 1. And, although judged by modern standards of accuracy, his work is open to some criticism, yet, as a starting point for investigation in several important directions, his results are invaluable.

SECTION I.

PART II.—THE LEGAL VALUE OF RENNELL'S MAPS

By F. D. ASCOLI, F.R.G.S., I.C.S.

15. Legal history of Rennell's maps.—The Survey of Major Rennell was first used for revenue purposes on an extensive scale during the diara survey of Babu Parbati Charan Ray. Under the instructions of the Board of Revenue, large releases of land from resumption under Act IX of 1847 were made by the Commissioners of the Dacca Division on the basis of Rennell's maps (*vide* Commissioner to the Board No. 1039 A., dated 17th February 1880). The maps used for the purpose of relay were the small scale printed compilations in the Bengal Atlases of 1780 and 1781. In the letter above referred to, the Commissioner remarks :—“There is no doubt, however, that they (Rennell's maps) are the best available evidence of the condition of things at the time of the Permanent Settlement.” At that time the value of Rennell's maps for revenue purposes had not been contested in the Courts of Law and the decision of the Board of Revenue that whatever was surveyed by Rennell as land should be admitted to have been included within the Permanent Settlement must be interpreted as an act of grace and not as one founded on a legal obligation. Subsequently the relevancy of Rennell's maps in such circumstances has been the subject matter of several decisions of the Courts, notably Sarat Chandra Sinha *versus* Kshitis Chandra Ray (C. L. J. XII, page 219), the Secretary of State for India in Council *versus* Kalika Prasad Mukherji (C. L. J. XV, page 281) and Hemanta Kumari Debi *versus* The Secretary of State for India in Council (C. L. J. III, page 566). The issue discussed in these cases is whether Rennell's maps can be held to afford any direct evidence regarding the inclusion of lands within permanently-settled estates at the time of the Decennial Settlement. It may be remarked that the Decennial Settlement was concluded in different districts

between the years 1789 and 1792 and that Rennell's original surveys were made in 1764 and the few years immediately succeeding.¹

It may be noted that Rennell's survey was made under the authority of Government (*vide* orders of Hon'ble Henry Van Sittart, Governor of Fort William, dated 6th May 1864)²; the maps were not made for the purpose of any cause, and therefore a presumption of accuracy attaches to them under section 83 of the Indian Evidence Act (Act I of 1872). How far these maps are in themselves relevant facts regarding the inclusion of lands within permanently-settled estates requires more detailed examination.

In *Annada Hari Basak versus* The Secretary of State for India in Council (C. L. J. III, page 316) it is clearly laid down that the onus of proving that any particular lands were included in the Permanent Settlement of 1793 is on those who affirm that such was the case; that the thak and survey maps are valuable evidence of the state of things at the time they were made, but such state of things cannot be presumed to have existed at the time of the Permanent Settlement (*cf.* Jagadindra Nath Ray *versus* The Secretary of State for India (I. L. R., 30 Calc., 291). It was further held that chittas of 1777 were not evidence of the state of things at the time of the Decennial Settlement.

This latter reference would refer with equal force to the evidentiary value of Rennell's maps. The Court thus showed its unwillingness to accept as a proof of the boundaries of permanently-settled estates documentary evidence prepared only some 12 years before the Decennial Settlement, or even a map prepared in later years with the object of defining the boundaries of estates, as they existed at the time of survey. It is clear then that Rennell's maps cannot be admitted as proof of the boundaries of estates or even of the existence of land in 1793, the more so, as they were not prepared as revenue maps. It is true that in certain plates of the Bengal Atlas (*e.g.*, Plates VI-IX), the boundaries of certain parganas have been shown, but as has rightly been laid down in Secretary of State for India *versus* Kalika Prasad Mukherji (C. L. J. XV, page 281), the survey was made for the purpose of showing the courses of rivers and the different land routes through the country. Rennell produced topographical and not revenue maps, and it may be noted that the major portion of Rennell's original work was complete before the East India Company assumed the full control of its land revenue in 1772.

The following quotations from reported cases will show clearly the attitude of the Courts towards Rennell's maps and the unvarying adherence to the doctrine laid down in C. L. J. III, page 316. I quote first from Lord Davey's judgment in *Hemanta Kumari Debi versus* The Secretary of State for India (C. L. J. III, page 566):—"The earliest documentary evidence is an extract from Rennell's survey map dated the 7th July 1780 (it may be noted that this is the date of publication and not of survey) and therefore nearly contemporary with the Decennial Settlement on which the Permanent Settlement was based. This map shows that the disputed land was dry land, but beyond this general remark it does not appear to their Lordships to afford any safe inference either for or against the first appellant." I need only note that in this case the Privy Council accepted Rennell's map as showing the land in existence in the supposed year of survey, but denied that it showed that the land was included within the boundaries of any specific estate.

In *Sarat Chandra Sinha versus* Kshitis Chandra Ray (C. L. J. XII, page 219) the practicability of using Rennell's maps for the purpose of defining the boundaries of estates permanently-settled in 1793 was finally laid to rest:—"His (the appellant's) contention is", runs the judgment, "that the rights of the parties ought to have been determined not with reference to the Survey map, but on the basis of the map of Major Rennell." After dealing with the difficulty of relaying the map, the judgment proceeds:—"In the third place, as has been repeatedly pointed out by this Court, the map of Major Rennell was not prepared for revenue purposes. There is further nothing to show that when the Decennial Settlement was made in 1789. . . the survey made by Major Rennell and his associates was adopted as the basis of settlement. . . . Under these circumstances we are unable to uphold the contention of the appellant that the map of Major Rennell ought

¹ Rennell left India in 1777.—F. C. H.

| See para. 125, page 38 of this Memoir.—F. C. H.

to be accepted as the basis for the determination of boundaries of the estate of the plaintiff. If we were to do so, we should have to use the map for a purpose for which it was never intended to be used ; it would not be right to accept as a basis for the determination of boundaries of permanently-settled estates, a survey which had been made 25 years before, for the purpose of showing mainly the courses of rivers and land routes throughout the country." This ruling is followed directly in *Secretary of State for India versus Kalika Prasad Mukherji* (C. L. J. XV, page 281).

The effect of these rulings is to show that the release of lands during the Diara Survey (1880-82) on the grounds that the lands were in existence at the time of Rennell's survey and were accordingly presumed to lie within the boundaries of permanently-settled estates, has no legal justification. The Courts have, however, accepted Rennell's maps as correctly showing the condition of the country, in the year of survey in *Hemanta Kumari Debi* (quoted above) and again in *Sarat Chandra Sinha versus Kshitis Chandra Ray* (C. L. J. XII, page 219), where it was held that Major Rennell's map had been rightly used to determine the course of the river Bhagirathi before the time of the Permanent Settlement. It appears then that the only use to which Rennell's map can be put for revenue purposes is as subsidiary evidence in locating places the existence of which within certain estates at the time of the Decennial Settlement is proved by documentary evidence, but the position of which is not shown in the thakbast or survey maps. As a specific example may be quoted Rajnagar pargana lying mainly on both banks of the river Padma in the districts of Dacca and Faridpur. This pargana was partitioned under the orders of Government by Mr. George Thompson between the years 1790 and 1792 ; the partition papers, on which the Permanent Settlement was concluded, are still in existence and include the names of several villages not shown in the thakbast or survey maps, but clearly identifiable in Rennell's maps. The partition papers alone are insufficient to locate the position of the villages without the aid of Rennell's maps which thus become valuable evidence. In such circumstances the possibility of knowing which of Rennell's maps are reliable and capable of relay is invaluable, in deciding whether they can be accepted as evidence or not. The maps in themselves are not facts relevant to the inclusion of lands shown in them within the boundaries of permanently-settled estates, but in the circumstances above described they may become under section 9 of the Indian Evidence Act (1 of 1872) relevant in explaining and supporting the inference suggested by the partition papers.

SECTION II.

PART I.—SPECIAL SURVEYS OF THE GANGES RIVER.

"The Ganges from Jellinghi to the Megna."

In 14 parts. Scale about 500 yards to 1 inch. For the distribution of these parts, *see* Index map No. 1.

16. Rennell's scale not quite accurate.—Before describing this series it must be explained that the scale given by Rennell is not exactly 500 yards to 1 inch. On the first map of the series the following note appears :—

"Scale 4 inches to a nautic mile or 500 yards to an inch. As a Sea (or nautic) mile is 2,030 yards, and $69\frac{1}{2}$ of these miles. " The rest of this note is obliterated, but a brief calculation shows that the real scale is *507.5 yards to 1 inch*, instead of *500 yards to 1 inch*, as recorded by Rennell. It may be remembered that Rennell until 1764 was a Marine Surveyor. This accounts for his preference for nautical instead of statute units.

PART I.—(I. O. Map Catalogue 1878, page 101—A. X. 3).

17. Ganges River, Jellinghi to Damadur.—"A survey of the Southern banks of the Great River Ganges, from the mouth of the Jelenghee towards Dacca, made by order of the Hon: Henry Van Sittart, Esq., Governor of Fort William, etc., by James Rennell, Surveyor, No. 1, from Jelen ee to Damadur, containing about 61 English miles."

Scale, etc.—507·5 yards to 1 inch; size 34 inches by 75. Manuscript; original in the India Office.

Date of Survey.—21st May 1764 to 28th May 1764.

Method of Survey.—Rennell's river method. Bases and traverse lines are shown on the map.

Number in new Atlas.—Plate 1 (in 3 parts).¹

PART II.—(I. O. Map Catalogue 1878, page 101—A. X. 4).

18. Ganges River, Damadur to Custee.—"A survey of the southern banks and channels of the Great River Ganges from the head of the Jelenghee towards Dacca. No. 2 from Damadur to Custee, in distance 17 statute miles. J. Rennell Surveyor, 1764."

Scale, etc.—507·5 yards to 1 inch; size 29 inches by 41. Manuscript; original in the India Office.

Date of Survey.—29th to 31st May 1764.

Method of Survey.—As for Part I.

Number in new Atlas.—Plate 2 (in 2 parts).

PART III.—(I. O. Map Catalogue 1878, page 101—A. X. 5).

19. Ganges River, Custee to Oddegjea.—"A survey of the southern banks and channels of the Great River Ganges, from the head of the Jelenghee towards Dacca. No. 3, from Custee to Oddegjea², in distance 20 statute miles. J. Rennell, Surveyor, 1764."

Scale, etc.—507·5 yards to 1 inch; size 32 inches by 62. Manuscript; original.

Date of Survey.—1st to 17th June 1764.

Method of Survey.—As for Part I.

Number in new Atlas.—Plate 3 (in 3 parts).

The map shows the head of the Custee creek³ on the south, the mouth of the creek to Pabna, and also an unnamed creek on the north.

PART IV.—(I. O. Map Catalogue 1878, page 101—A. X. 6).

20. Ganges River, Oddegjea to Saatpour.—"A survey of the southern banks and channels of the Great River Ganges, from the head of the Jelenghee towards Dacca. No. 4 and last containing from Oddegjea⁴ to Saatpour, in distance 15 statute miles, likewise 7 miles of Maudopore creek from the head to Maleeat. J. Rennell, Surveyor."

Scale, etc.—507·5 yards to 1 inch; size 50 inches by 29. Manuscript; original in the India Office.

Date of Survey.—18th to 21st June 1764.

Method of Survey.—As for Part I.

N.B.—"This, with the other three drafts, contains 83 British Statute miles of the great Gauges,⁵ June 1764"

¹ For convenience of handling, in the new Atlas, the larger sheets have been cut to convenient sizes. In such cases where necessary extra certificates of verification have been added by me.—F. C. H.

² Near Gubycundapour.

³ See I. O. Map Cat 1878, page 104, for detailed survey of the Custee creek. The map is reproduced in the new Atlas as plate A.

⁴ Near Gubycundapour. Near Charbagat.

⁵ See Memoir, Asiatic Societies, Bengal, Volume III. No. 3, page 119. There Rennell refers to the despatch of the first set of maps of his Jellinghi-Meghna River Survey. He despatched his maps in convenient batches to the Governor of Fort William. For this reason he calls this map "No. 4 and last", i.e., the last section of a batch of maps ready for despatch.

Number in new Atlas.—Plate 4 (in 2 parts).

The map shows about 7 miles from the Ganges southwards of the Mandapour Creek,¹ with soundings.

The width of the river is given near Horrisonkorpour as 3,720 feet, and has apparently been measured with some accuracy.

PART V.—(I. O. Map Catalogue 1878, page 101—A. X. 7).

21. Ganges River, Saatpour to Betturey.—"An exact survey of the Great River Ganges from the head of the Jelenghee River towards Luckeypour, by J. Rennell, Surveyor. No. 5 containing from Saatpour² to Betturey, in distance $26\frac{1}{2}$ statute miles."

Scale, etc.—507·5 yards to 1 inch.

Magnetic variation, 1° West.

Size, 30 inches by 68.

Manuscript. Original in the India Office.

Date of Survey.—20th September to 8th October 1764.

Method of Survey.—As for Part I.

Number in new Atlas.—Plate 5 (in 3 parts).

The map shows the whole course of the Oringberry Creek, and the mouth of the Rottingunge and Joppergunje (Jaffarganj) Creeks, as well as that of the Hageagunge Creek on the south of the main river. The Jaffarganj Creek occupies approximately the present main channel of the Jamuna (Brahmaputra) near where it joins the Padda (Ganges).

PART VI.—(I. O. Map Catalogue 1878, page 101—A. X. 8).

22. Ganges River, Betturey to Sauppour.—"An exact survey of the Great River Ganges from the head of the Jelenghee River towards Luckeypour, by J. Rennell, Surveyor. No. 6 containing Betturey to Sauppour³, in distance $11\frac{1}{2}$ statute miles."

Scale, etc.—507·5 yards to 1 inch.

Magnetic variation, 1° West.

Size, 42 inches by 21.

Manuscript. Original in the India Office.

Date of survey.—9th to 20th October 1764.

Number in new Atlas.—Plate 6 (in 2 parts).

PART VII.—(I. O. Map Catalogue 1878, page 101—A. X. 9).

23. Ganges River, Sauppour to Hageagunge Creek.—"An exact survey of the Great River Ganges from the head of the Jelenghee River to Luckeypour, by J. Rennell, Surveyor. No. 7 containing from Sauppour³ to the mouth of the Hageagunge Creek, in distance 10 miles and a half."

Scale, etc.—507·5 yards to one inch.

Variation of the magnetic needle be from 17° E to 50° W.

Size, 18 inches by 46.

Manuscript. Original in the India Office.

Date of survey.—21st to 25th October 1764.

Number in new Atlas.—Plate 7 (in 2 parts).

The map shows the heads of the Corateally and Hageagunge Creeks on the south.

¹ For the rest of the Mandapour Creek, see I. O. Map Cat. 1878, page 104, and Plates 27 & 28 of the new Atlas.

² Near Charbagat.

³ Opposite Mullopara.

PART VIII.—(I. O. Map Catalogue 1878, page 102—A. X. 10).

24. Ganges River, Hageagunge Creek to Bromgunge.—"An exact survey of the Great River Ganges from the head of the Jelenghee River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 8 containing from Hageagunge¹ Creek to Bromgunge², in distance $19\frac{1}{2}$ statute miles."

Scale, etc.—507·5 yards to one inch.

Size, 23 inches by 65.

Manuscript. Original in the India Office.

Date of survey.—16th to 25th October 1764.

Number in new Atlas.—Plate 8 (in 3 parts).

On the north bank of the Ganges two creek mouths are shown, both being branches of the Isamutoy River; on the south is an unnamed creek near Paunchor and the Creek to Hobbygunge (Habiganj).

The map shows the Neurpour Pagodas; by the map they are under 3 miles from Gohulercandy, and their position does not seem to have been fixed accurately.³ This point is mentioned here to emphasize the necessity of checking the relative positions of all points chosen as fitting points for comparisons before comparative map work is attempted.

The map shows a tiger's track on one of the islands. Tigers are now practically extinct in this locality, but their extinction is of very recent date.

A straight line is shown across the map from Bunderculla Island to the North Bank. It suggests direct measurement, but no measure is recorded.

PART IX.—(I. O. Map Catalogue 1878, page 102—A. X. 11)."

25. Ganges River, Bromgunge to Binetty.—"An exact survey of the Great River Ganges from the head of Jelenghee River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 9 containing from Bromgunge⁴ to Binetty, in distance $13\frac{1}{2}$ statute miles."

Scale, etc.—507·5 yards to 1 inch.

Size, 49 inches by 27.

Manuscript. Original in the India Office.

Date of survey.—5th to 9th November 1764.

Number in new Atlas.—Plate 9 (in 2 parts).

On the map the main Rajnagore "Steeple" is said to bear N. 35°. 36' E of Survey station 12. but that station is not shown on the map. It was somewhere at the south end of Gonganagore Island. The distance of the steeple from station 12 is given as 9,390 yards. Even if the exact position of station 12 could be located, the details given for fixing the steeple could not be relied upon for relaying or comparative purposes. Yet there are many Indian Surveyors, who, on the slight information available, would not hesitate to make practical use of Rennell's fixing of the steeple.

Several creek mouths are shown on this map; thus Badarashon Creek to Hobbygunge is shown on the right bank.

PART X.—(I. O. Map Catalogue 1878, page 102—A. X. 12.)

26. Ganges River, Binetty to Gazarya.—"An exact survey of the Great River Ganges from the head of Jelenghee River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 10 containing from Binetty¹ to Gazarya², in distance 18 statute miles."

Scale, etc.—507·5 yards to 1 inch.

Size, 54 inches by 21.

Manuscript. Original in the India Office.

Date of Survey.—9th to 17th November 1764.

Number in new Atlas.—Plate 10 (in 3 parts).

Several creeks are shown and the Bakarganj River was surveyed for about a mile below its exit from the Ganges.

¹ Opposite Monsadabads.

² Near Paunchor.

³ Rennell's Diary—Mem., As. Soc., Bengal, Volume III, No. 3, page 130, 1910.

⁴ Near Chyenndy and the south end of Gonganagore Island.

⁵ Near Tockya Island.

PART XI.—(I. O. Map Catalogue 1878, page 102—A. X. 13.)

27. Ganges River, Gozarya to Soynary.—"An exact survey of Great River Ganges, from the head of Jelenghee River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 11 containing from Gozarya¹ to Soynary², in distance 14 statute miles."

Scale, etc.—507·5 yards to 1 inch.

Size, 29 inches by 24½.

Manuscript. Original in the India Office.

Date of Survey.—20th to 28th November 1764.

Number in new Atlas.—Plate 11 (in 2 parts).

The map shows two Pagodas, the position of the western of which seems to be accurately mapped.

A large channel of the Brahmaputra is shown at the Northorn end of the map.

PART XII.—(I. O. Map Catalogue 1878, page 102—A. X. 14.)

28. Ganges River, Soynary to Chormoddanya Creek.—"An exact survey of the Great River Ganges, from the head of the Jelenghee River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 12 from Soynary³ to Chormoldanya Creek, in distance 10 statute miles."

Scale, etc.—507·5 yards to 1 inch.

Size, 21 inches by 35.

Manuscript. Original in the India Office.

Date of Survey.—November 1764.

Number in new Atlas.—Plate 12 (in two parts).

PART XIII.—(I. O. Map Catalogue 1878, page 102—A. X. 15.)

29. Ganges River, Chormodanya Creek to Mendygune Creek.—"An exact survey of the Great River Ganges from the head of Jelenghoe River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 13 containing (from the mouth of Chormoddanya Creek to the conflux of the Eastern and Western Rivers⁴ and likewise part of Mendygungo Creeks), 8 miles."

Scale, etc.—507·5 yards to 1 inch.

Size, 30 inches by 21.

Manuscript. Original in the India Office.

Date of Survey.—November and December 1764.

Number in new Atlas.—Plate 13.

Only about one mile of the Mendygune Creek is shown.

At this point Rennell left the main Ganges and crossed to the Brahmaputra by the Mendygune Creek, which is shown on the next part of this series.

PART XIV.²—(I. O. Map Catalogue 1878, page 102—A. X. 16.)

30. Ganges River, Mendygunge Creek to Comercally.—"An exact survey of the Great River Ganges from the head of Jelenghee River to its conflux with the Baramputry, by J. Rennell, Surveyor. No. 14 containing part of the North channel, Mendygunge, etc., in distance 7½ miles from Assycur to Comercally.⁵"

Scale, etc.—507·5 yards to 1 inch.

Size, 25 inches by 21.

Manuscript. Original in the India Office.

Date of Survey.—December 1764.

Number in new Atlas.—Plate 14.

The first sheet of Rennell's Megna Survey⁶ is supposed to join with this Plate. As a matter of fact there is a small hiatus of which no large scale map exists.

¹ Near Tockya Island.

² Near Kistymaria.

³ Near Sunapara.

⁴ Assycur.

⁵ On the East of Mendygungj.

⁶ See Index Map No. 1.

SECTION II.

PART II.—THE MEGNA RIVER SURVEY.

31. Relation between Rennell's Ganges and Megna River Maps.—The Ganges Series of original maps (Parts I to XIV, pages 101 and 102, I. O. Map Cat. 1878), and plates 1 to 14 of the new Atlas, showed the course of the Ganges from Jellinghi River practically to its junction with the Brahmaputra (Megna) near Mendygunge. The Megna series contains the original maps from the conclusion of the Ganges series, northwards from near Mendiganj to Dacca. This series falls on five sheets, all on the scale of 2 inches to 1 mile¹.

The five maps of the Megna series are described in detail below :—

MAP I.—(I. O. Map Catalogue 1878, page 103—A. X. 18.)

32. Megna River, Mendygunge Creek to Doycalley Point.—“An exact survey of the River Megna from its conflux with the Ganges to Cassempour *reduced from the original survey to a scale of 2 inches to a statute mile*,² by J. Rennell, Surveyor, 1765. No. 1 containing the western share of the Megna from the Ganges³ to Doycalley Point. in distance 9 statute miles.”

Scale, etc.—Two inches to 1 mile.

Size, 21 inches by 23.

Manuscript. Original in the India Office.

Number in new Atlas.—Plate 15.

The map shows by special symbol the positions of certain villages determined “mathematically.” My own impression is that this series includes some of the best river work done by Rennell, and that it represents an advance in accuracy upon the Ganges and Creek series surveyed previously. But I am unable to substantiate the impression by practical evidence amongst the papers available.

MAP II.—(I. O. Map Catalogue 1878, page 103, A. C. 19.)

33. Megna River, Doycalley Point to Saddoukpour.—“An exact survey of the River Megna, etc., by J. Rennell, Surveyor. No. 2 containing from Doycalley Point to Saddoukpour, in distance 19 statute miles, 1765.”

Scale, etc.—2 inches to 1 mile.

Size, 21 inches by 43.

Manuscript. Original in the India Office.

Number in new Atlas.—Plate 16 (in 2 parts).

MAP III.—(I. O. Map Catalogue 1878, page 103, A. X. 20.)

34. Megna River, Saddoukpour to Beerackondy.—“An exact survey of the River Megna, etc., by J. Rennell, Surveyor. No. 3 containing from Saddoukpour to Beerackondy⁴, in distance 22 miles, 1765.”

Scale, etc.—2 inches to 1 mile.

Size, 21 inches by 43.

Manuscript. Original in the India Office.

Number in new Atlas.—Plate 17 (in 2 parts).

This map shows the Rajabari temple which still stands, but is now very close indeed to the water's edge.

The map also shows the site of Chandpur village.

¹ These 5 maps were illustrated by an index map, scale 2 miles to 1 inch. I have classified that map as of no practical use, as it is superseded by the index maps used in this report. For description of this map, see page 37 of this report (I. O. Map Cat. 1878, page 102—A. X. 17).

² The original maps by Rennell on the larger scale are not forthcoming. This is not a serious matter, as these 2-inch maps are sufficiently large for tolerably close comparison work.

³ From Part XIV Ganges Series, I. O. Map Cat. 1878, page 102—A. X. 16; or Plate 14 of the new Atlas. As stated already in paragraph 30 the junction between the Mendygunge Creek and the Brahmaputra (Megna) river is not perfect in Rennell's Ganges and Megna River maps.

⁴ Near Rajabari.

MAP IV.—(I. O. Map Catalogue 1878, page 103, A. X. 21.)

35. Megna River, Beerackondy to Ferringybazar.—"An exact survey of the River Megna, etc., by J. Rennell, Surveyor. No. 4 containing from Beerackondy¹ to the mouth of the Issamutley River and the Issamutley to Ferringybazar, in distance 15 miles. 1765."

Scale, etc.—2 inches to 1 mile.

Size, 21 inches by 30.

Manuscript. Original in the India Office.

Number in new Atlas.—Plate 18.

It is from this map that Rennell's Brahmaputra series² breaks off to the East and follows the old channel of the Main Brahmaputra, *viâ* Mymensingh Town to Goalpara, in Assam.

For enquiries into the area overlap see I. O. Map Cat. 1878, page 117, A XIII. 1 (Plate 20 of the new Atlas; both that map and this should be consulted.

MAP V.—(I. O. Map Catalogue 1878, page 103—A. X. 22.)

36. Megna Series, Feringybazar to Dacca.—"An exact survey of the Rivers and Creeks between Feringybazar and Dacca, being a continuation of the route from Luckypour to Dacca, with exact plans of Iddyracpour and Daapeka Kellas,³ by J. Rennell, Surveyor. No. 5 and last of the Survey containing 15 miles."

Scale, etc.—2 miles to 1 inch.

Size, 21 inches by 30.

Manuscript. Original in the India Office.

Number in new Atlas.—Plate 19.

This map does not strictly belong to the Megna Series, but it was made, apparently, to give the best all-the-year-round river routes as far as Dacca, then as now, a city of great importance. The scale unit of the Fort Plans is the "Toise".⁴ The plan of the Iddyracpour Fort could be checked now, as a portion of the Fort has been adopted as a residence for the Sub-divisional Officer at Munshiganj. The checking of the Fort plan would not necessarily imply anything regarding the accuracy of the river surveys of this series.

37. Connection between the Megna and Brahmaputra Series of Maps.—The connection with Rennell's Megna series of maps and his maps of the Brahmaputra—*i.e.*, the original Brahmaputra channel passing Mymensingh—is described in the next section.

SECTION II.**PART III.—RENNELL'S SURVEY OF THE BRAHMAPUTRA SERIES.**

38. Connection between Rennell's Megna and Brahmaputra River Maps.—This series gives Rennell's Survey of the Brahmaputra River from Map IV of the Megna River Series,⁵ to some miles above Goalpara in Assam, *viâ* Mymensingh Town.

The original maps compiled in the field appear to have been on the scale of 2 inches to 1 mile, but all these are lost except the first section, which has been preserved in duplicate.

¹ Near Rajabari.

² See I. O. Map Cat. 1878, page 117 A. XIII Maps 1 and 2, and Plate 20 of the new Atlas.

³ "Kella" = "Kila" = Fort.

⁴ French measure. One Toise = 6.025 fathoms.

⁵ I. O. Map Cat. 1878, page 103, A. X. 21), and Plate 18 of the new Atlas.

The Lakhia River is not shown on this plate, but separately as a "sketch" in I. O. Map Cat. '1878, p. 104, A. X. 32. (Plate 35 of the new Atlas).

The map contains in the first 19½ miles the details shown on map I of this series¹ (see above). The latter should be used for close comparison map work for those reaches of the river depicted upon it.

41. Brahmaputra river. Lukhya River take off to Coustya, near Mymensingh.—"Part II"—Containing from the head of the Lukhya river to Coustya,² in distance 53 statute miles."

Scale, etc.—Two miles to 1 inch.

Size 18 inches by 30.

Manuscript. Original in the India Office.

Date of survey.—June and July 1765.

Number in new Atlas.—Plate 22.

42. Brahmaputra River, Mymensingh to Chilmari.—"No. 3 containing from Baganbarry to Chilmari, in distance 69 miles."

Scale, etc.—Two miles to 1 inch.

Size, 18 inches by 30.

Manuscript. Original in the India Office.

Date of survey.—The date given on the map is October and November 1765,³ but this is not strictly accurate. In July 1765, Rennell made a "cursory" survey of the main river from Mymensingh to Chilmari, and then went to Dacca and apparently remained there until October of that year, when he resumed the survey of the Brahmaputra. He did not, however, re-survey the western bank (*i.e.*, the more pronounced bank) from Baiganbari to Dewanganj in October 1765, but accepted for it the cursory work of the previous July. With this exception the map shows surveys made in October and November 1765.⁴

I have mentioned an apparently trivial point for an important reason. It was from the right bank of the Brahmaputra between Baiganbari and Dewanganj that the present Jamuna opened out, and became the main channel of the Brahmaputra. Rennell's map described here shows no large channel escaping in the direction of the present Jamuna. But Rennell's 5-mile to the inch map (Plate 45 of the new Atlas) shows such a channel as established, although his map of Inland Navigation (Plate 37 of the new Atlas) shows that the channel was not open for navigation all the year round.

Rennell's survey of the right bank was made when the river was high and any use of this map must be based, at least partially, upon the consideration of that fact.

Number in new Atlas.—Plate 23.

43. Brahmaputra River, Chilmari to Rangamatti.—"No. 4 containing from Chilmari to Rangamatty Chokey, in distance 62 miles; with the course of the Dherla River, from its mouth of Currygong; the Teesta Creek to Olyapur, and the Suncoas⁵ to Rangamatty."

Scale, etc.—2 miles to 1 inch.

Size, 18 inches by 30.

Manuscript. Original in the India Office.

Date of survey.—November 1765.

Number in new Atlas.—Plate 24.

44. Brahmaputra-Rangamatty to just beyond Goalpara.—"No. 5 and last, containing from Rangamatty Chokey to Commerput (the eastern limit

¹ I. O. Map Cat. 1878, p. 117 A. XIII (1) and plate 20 of the new Atlas.

² Near Baiganbari or Mymensingh.

³ Mem., As. Soc. Bengal. 1910, Vol. III, No. 3, page 152.

⁴ "The 10th of October whilst at Dacca I received Lord Olive's Orders to set about forming a general Map of Bengal with all Expedition; and as it appeared to be a very tedious work should all the Distances be exactly ascertained, his Lordship gave Directions that they should be taken in a Cursory Manner only, correcting them by Latitudes and any other eligible Means."—See Rennell's Diary, Mem. As. Soc. Bengal, 1910, p. 151.

⁵ I am inclined to think that the map described above and those following it in this series were made entirely by "cursory" survey as a result of Lord Olive's orders referred to above; but there is no definite proof that my supposition is correct.

of Bengal towards the river) in distance 62 miles; together with the Provinces of Bisnee, and the courses of several rivers through that country; showing the limits of Bengal towards Assam and Boutan."

Scale, etc.—2 miles to 1 inch.

Size, 18 inches by 30.

Manuscript. Original in the India Office.

Number in new Atlas.—Plate 25.

This map refers entirely to Assam, but I have noted it as advisable to copy because it may have a value to the Province of Assam, and may be useful in the study of the river movements of the Bengal Duars, between which area and the present boundary of Assam, the Sunkos River forms a portion of boundary.

The map shows certain boundaries, which are almost certainly only vaguely mapped.

SECTION II.

PART IV.—RENNELL'S SPECIAL SURVEYS OF MINOR RIVERS (CREEK SERIES).

45. Objects of the Creek Surveys.—The main object of the Creek Series of Surveys, as has been stated on page (ii) of this report, was to find the most convenient perennially navigable route from Calcutta to the Main River system, *viâ* Channel Creek.¹

Throughout his operations until the end of 1766 at least, Rennell never lost sight of the necessity for discovering routes by minor channels which would act as short cuts, or preclude the necessity for navigating the larger rivers, which, in times of flood and storm, were navigated with danger. A perusal of Rennell's diary makes this point abundantly clear. But ordinarily speaking he does not appear to have attempted *exact* survey work in his maps of creeks. Therefore the actual uses to which the creek maps can now be put are probably restricted to the consideration of river movement questions. Even for examining such matters it is somewhat doubtful how far, at this moment, the creek maps are of practical use. I believe, however, that at some future date, anyhow, the maps will have sufficient practical value to River Engineers, to warrant their publication before the originals become lost or too distorted to be copied accurately.

46. Original Creek Survey maps fragmentary.—The remains of Rennell's Creek work are very fragmentary. His diary shows that many special maps now not forthcoming were made. This fact may explain the somewhat disjointed state of the maps described below, which in actual fact do not comply with Vansittart's orders to Rennell to discover a convenient navigable route *viâ* Channel Creek. Rather the plans illustrate alternative routes to main stream routes, which were mostly discovered by Rennell whilst groping to find the best all the year round route to the Ganges from Calcutta *viâ* Channel Creek.

Index map No. 1 shows the existing original maps of Rennell's Mandapour, Comer, Loricule, Lakhya, and Bally Creeks.

Proceeding down the Ganges (see Index map No. 1), Rennell first came to the Custee Creek (Plate 26 of the new Atlas), surveyed it, but found it impassable shortly below its off-take from the Ganges. His next attempt was to explore the Chundna River (Maudapour Creek), which takes off from plate 4 of the new Atlas and runs south by east.

The course of this creek was traced to its junction with the Comer (see below), and the survey fell on three sheets. The limits of the second two

¹ It will be observed that Rennell's orders excluded the consideration of the routes offered by the upper feeders of the Hooghly River, viz., the Bhagirathi, Jellinghi and Mathabhanga Rivers. The inference is that those three rivers, as early as 1764, were considered sufficiently decadent to be unreliable as all the year round routes.

(Plates 27 and 28 of the new Atlas) shown on Index map No. 1 as 27 and 28, and the details which would have been in the third plate are given on Plate 4 of the new Atlas.

Meeting the Comer Creek, Rennell surveyed it in two directions : —

(a) That shown on Plates 29 and 30 of the new Atlas which show the Creek practically to its lower junction with the Ganges (Plate 9 of the new Atlas), and (b) its course from the west on Plates 31 and 32. A portion of the western course is missing. When Rennell was employed on the survey of Plate 32 he found the channel blocked by a shoal with only $1\frac{3}{4}$ cubits of water over it. This shoal spoilt any chance of a westerly route to Channel Creek.¹

Rennell then in 1764 completed his survey of the Ganges on the XIV Plates shown on Index map No. II. During this work he found a navigable short cut between Plates 9 and 28 of the new Atlas by way of the Luricule or Chiddypour Creek (Plate 34 of the new Atlas).

Later, having completed the Megna River Series and the first two plates of the Brahmaputra Series, Rennell mapped the course of the Lakhia River (Plate 35) as an alternative rainy season route to that afforded by the main Brahmaputra. (See Plates 18, 20 and 21 of the new Atlas).

One other Creek fragment remains, *viz.*, Map 36 on Index map No. 1. It is merely a sketch of the mouth of the Bally Creek and the reasons for the survey are not known. They do not appear to have been connected with Rennell's original orders issued by Van Sittart.

The detailed maps upon which Rennell depended to discover the final routes from Calcutta to the main river system are not now available. The routes, however, are shown on Plate 48 of the new Atlas (Rennell's 5 mile to 1 inch series of Bengal)².

The notes above will explain sufficiently the relations between the different maps of this series. Those maps are explained below.

CUSTEE CREEK.

47. The Custee Creek.—"A particular plan of Custee Creek from the head to the bar, surveyed 9th June 1764, by J. Rennell, Surveyor."³

Scale, etc.—About 200 yards to 1 inch, which is an unusually large scale for Rennell to have used.

Size, 12 inches by 17.

Manuscript. Original in the India Office.

This map shows the take-off of the Custee Creek from Plate 2 of the new Atlas (Ganges Series) (I. O. Map Cat. 1878, p. 101, A. X. 4). The position of the map described here is indicated on Index map No. 1 as number 26.

The map shows soundings in cubits in the *dry season*, but the only length of the creek surveyed was from its head to the first *bar* where so little water was found that Rennell discarded this Creek as a possible route to Calcutta. The plan only took one day (9th June 1764) to make, and is described as a "Particular" Plan. The survey is only approximately correct.

Number in new Atlas.—Plate 26.

MAUDAPOUR OR CHUNDNAH CREEK.—In 3 Parts, 1764.

48. The Chundnah Creek in 3 portions.—*Part I.*—Contained in Rennell's Ganges Series, Section 4 of Index Map No 1. (I. O. Map Cat. 1878, p. 101, A. X 6) for description *see* description of Plate (4) of the new Atlas, *vide* page 8 of this Memoir.

¹ During these operations Rennell also made an index map (Plate 33 of the new Atlas) with details of certain other creeks on the north (Bacout, Culseedar and Letydoman Creeks, etc.) This map also shows the missing portion between Plates 31 and 32.

² See I. O. Map Cat. 1878, p. 162, I. A. C. 13.

³ I. O. Map Cat. 1878, p. 104, A. X. 30.

*Part II*¹.—"Survey of Maudapour Creek, No. 2, from Maleeat to Serampour, distance $20\frac{1}{2}$ statute miles. by J. Rennell, Surveyor. June, July 1764."

Scale, etc.—507·5 yards to 1 inch.

Size, 38 inches by 28.

Manuscript. Original in the India Office.

The map shows soundings in cubits at *low water*.

The map is marked as from a "Survey", and is probably not intended to be exact.

Number in new Atlas.—Plate 27 (in 2 parts).

*Part III*².—"Survey of Maudapour Creek, No. 3. from Serampour to the head of the Burrashe, in distance 18 British miles. J. Rennell, Surveyor. July 1764."

Scale, etc.—507·5 yards to 1 inch.

Size, 21 inches by 23.

Manuscript. Original in the India Office.

The map shows soundings in cubits at *low water*.

The map is marked as from a "Survey" and is probably not intended to be exact. This plate shows the Creek to its junction with the Comer Creek. For continuation, see next plate described below.

Number in new Atlas.—Plate 28.

COMER CREEK.—In 6 Parts, 1764.

49. Comer Creek,—*Part I*³.—"A general sketch of the Eastern Branch of the Comer Creek, by J. Rennell, Surveyor. No. 1, from the head near Motrapur to Cardya, in distance 41 miles, July 1764."

Scale, etc.—1 inch to 1 mile.

Size, 14 inches by 16.

Manuscript. Original in the India Office.

This map may or may not be a reduction of a larger scale map. In any case the map is on such a small scale that it is of no use except to give a general idea of the general course of the reaches depicted in 1764.

Number in new Atlas.—Plate 29.

*Part II*⁴.—"A general sketch of the Eastern Branch of Comer Creek, by J. Rennell, Surveyor. No. 2, from Cardya to the Ganges, in distance by the Creek, 45 miles. July 1764."

Scale, etc.—1 inch to 1 estimated mile.

Size, 15 inches by 21.

Manuscript. Original in the India Office.

This map does not quite reach as far as the Ganges, but it joins up with the Hobbygunge Creek on Plate 9 of the new Atlas. (I. O. Map Cat. 1878, p. 102, A. X II). Like the last map described this map merely gives a general idea of the run of the Creek, with no pretence to real accuracy.

Number in new Atlas.—Plate 30.

Part III is wanting.—It probably contained a portion of the Comer Creek between the southern end of Plate 28 of Index Map No. 1, and the plate described immediately below. For this missing portion of the Comer Creek see description of Plate VI of this series (Plate 33 of the new Atlas).

Part IV.—"No. 4.⁵ A Survey of that part of the Comer Creek which unites the northern part of the Burrashe and Burrasaat, with part of the Burrasaat, containing 16 British miles. July 1764."

Scale, etc.—507·5 yards to 1 inch.

Size, 37 inches by 20.

Manuscript. Original in the India Office.

¹ 27 on Index Map No. 1. I. O. Map Cat. 1878, p. 104, A. X. 28.

² 28 on Index map No. 1. I. O. Map Cat. 1878, p. 104, A. X. 29.

³ 29 on Index Map No. 1. I. O. Map Cat. 1878, p. 103, A. X. 23.

⁴ 30 of Index Map No. . I. O. Map Cat. . p. 103, A. X. 24.

⁵ 31 of Index Map No. . I. O. Map Cat. 1878, p. 102, A. X. 25.

The map shows soundings in cubits at low water. The survey was almost certainly done with at least tolerable accuracy, but it is very doubtful if the map should be used for revenue purposes.

Occasional soundings in cubits at low water are given on the map.

Number in new Atlas.—Plate 31 (in two parts).

Part I,¹ *No. 5.*—"A general sketch of the western branch of Comer Creek, from the head of the Burrasat eastwards to Luckeypour west-wards, with the depths of water in the dry season, particularly described by J. Rennell, Surveyor.

N. B.—This draft contains $9\frac{1}{2}$ miles."

Scale, etc.—1 inch to 1 "estimated" British mile.

Size, 15 inches by 21.

Manuscript. Original in the India Office.

This map is undated, but it was almost certainly made in July 1764. Near Awaypour, towards the western end of the map, Rennell found a bar with only $1\frac{1}{4}$ cubits of water over it at low water. For this reason he seems to have discontinued to trace the Comer further westwards.

Some soundings are shown on the map.

The map does not pretend to be accurate.

Number in new Atlas.—Plate 32.

*Part I*², *No. 6.*—"A general sketch of the navigable part of the north-west branch of Comer Creek, including the parts known by the names of Lettydoman, Culse law, and Bacout Creeks and containing nearly 21 British miles by J. Rennell, Surveyor, July 1764."

Scale—etc. 2 inches to 1 mile.

Size, 12 inches by 28.

Manuscript. Original in the India Office.

This map shows the reaches of river depicted upon Parts III, IV and V of the Comer Series, *as well as the creeks mentioned in the map heading above.* The map is not exact, and is only useful perhaps in the study of river movements, etc., in this area.

Number in new Atlas.—Plate 33.

CHIDDYPOUR OR LURICULE GREEK.

50. Luricule Creek.—*Map I*³.—"A map of Chiddypour or Luricule Creek which runs across country from the Ganges to the Megna and lies in the direct road from Sunderbund to Dacca, 1765, by J. Rennell."

Scale, etc.—1 inch to 1 British mile.

Size, 15 inches by 21.

Manuscript. Original in the India Office.

This map gives the channel between Plate 9 of the new atlas (Rennell's Ganges Series) and Plate 17 (Megna Series). *See Index map No. 1.*

This map is of no practical use except as an indication of the state of the Luricule Creek when Rennell mapped it.

Number in new Atlas.—Plate 34.

LUCKYA RIVER.

51. Map I⁴.—"A general map of the Luckya river from its separation from the Baramputrey to its conflux with the Issamuty and Megna, with Noranda Creek and the environs of the City of Dacca, 1765. By J. Rennell."

Scale, etc.—3 miles to 1 inch.

Size, 15 inches by 21.

Manuscript. Original.

The map is probably tolerably accurate, but not closely so.

The Luckya river runs from the northern end of Plate 21 of the new Atlas (Rennell's Brahmaputra Series) to Plate 18 (Megna Series). (*Vide Index Map No. 1.*)

Number in new Atlas.—Plate 35.

¹ On index map No. 1, *see* No. 32. I. O. Map, Cat. 1878, p. 103, A. X 26 (original.)

See also Part VI of the Comer Creek Series, described immediately below.

² I. O. Map, Cat. p. 103, A. X 27.

³ That is the reaches shown on Plates 29, 31 and 32 of the new atlas.

⁴ I. O. Map, Cat. 1878, p. 103, A. X 31 (original), V. No. 34 on Index map No. 1.

⁵ On Index map No. 1, *see* No. 35. I. O. Map, Cat. 1878, p. 103, A. X 32 (original).

Bally Creek.

52. Bally creek.—*Map I*¹.—"Survey of Bally Creek, by J. Rennell, Surveyor."

Scale, etc.—About 500 feet to 1 inch.

Size, 12 inches by 20.

Manuscript. Original in the India Office.

The scale is large and the object of the survey is not known.

Soundings are shown in cubits presumably at low water.

It is doubtful if the map is of any use except for river investigation purposes.

Number in new Atlas.—Plate 36.

SECTION III.

Special Maps.

53. Two special maps of importance.—Two maps published by Rennell which have considerable importance, although the scales on which they were published are very small, are dealt with here. They are Rennell's map of Inland Navigation (Bengal), and his Road Map of Bengal.

*Map of Inland Navigation*²—

"Map of Inland Navigation."

Scale—50 miles to 1 inch.

Number in new atlas.—Plate 37.

This map apparently was first issued by Rennell as a plate in 1781, with "An account of Ganges and Burrampooter Rivers"³. It shows clearly which rivers in Bengal were perennially navigable in the period 1764-1777⁴. Those portions of rivers only navigable in the rainy season are also indicated. In addition the map shows the limits of the annual inundation during the rainy season.

The main value of the map lies in the fact that it acts as a convenient index to larger scale maps showing the river system of Bengal. The larger scale maps do not show which rivers are navigable always, and the map described here, used in conjunction with those maps, is of great importance in the study of the inland navigable conditions of Bengal.

Road Map of Bengal.

54. The Roads of Bengal in Rennell's time.—This map was published in 1778, with Rennell's "Description of the Roads in Bengal and Bahar."

The value of the map is the fact that it gives at a glance those portions of the Province in its uplands, in which Rennell's larger scale "general" maps are most likely to be accurate. It is known that Rennell and his Assistants did not survey every road⁵, and the probability that good surveys were made along the roads shown in the road map is very strong.

The *scale* of the map is 75 miles to 1 inch.

The number of this map in the new atlas is 38.

Apart from the fact that this map is an index in the sense referred to above, the map has a distinct historical value. It may be taken that every road shown was unmetalled, and that most of the roads were unbridged and that ferries were only available along important routes. Combined with the information given on Plate 37, it is possible to obtain a tolerable understanding of inland communications about a century and a half ago. Since then, despite the introduction of railways and metalled roads, there has been little increase in navigable routes by the waterways of a Province unusually well situated for their development.

¹ Index map No. 1. *see* No. 35. I. O. Map, Cat. 1878, p. 163, A. X 33 (original).

² I. O. Map, Cat. 1878, p. 164, II, A.C. 19.

³ Phil Transactions, 1781. The pamphlet was afterwards included as an appendix to Rennell's "Memoir of Map of Hindustan," 1783, 1788 and 1792.

⁴ Presumably for boats of 300 mauls burden—draft about 3 to 4 feet. *See* paragraph 2, page (i) of this Memoir.

⁵ DuGlos, one of Rennell's assistants, mentions this fact in a fragmentary diary which is retained in original in the India Office.

SECTION IV.

DETAILED DESCRIPTION OF RENNELL'S 5 MILES TO 1 INCH
MAPS OF BENGAL.¹

55. North-West Bihar.—*Title.*—"A map of the northern part of Bahar containing the Sircours of Tirrut, Hajeepour, Bettya, and Seran, with part of the Sircour of Monghir."

Number in new atlas.—Plate 39 (in 2 parts).

Scale.—5 miles to 1 inch.

Size of map.—15" by 31".

Signed.—By Rennell.

An original map on thick drawing paper.

Area covered.—Districts Champaran, Muzaffarpur, Saran, Darbhanga, and portion of Monghyr and Bhagalpur. The whole area lies in the Province of Bihar and Orissa.

Surveyors.—Richards and Kyd. The whole area was surveyed by Captain William Richards except the road from Sidli to Hariarpur (in Nepal)², which was "sketched" by Captain Kyd in 1767 during the Nepal Expedition.

Methods used.—Richards probably used the same methods as Rennell. Kyd's work is of doubtful value.

Date of Survey.—Kyd, 1767; Richards, 1772, and perhaps two or three years earlier.

Date of Map.—1773.

Fitting points for comparisons.—Selected town and village sites only.

State of preservation of original map.—Good, but slight repairs are required.

Intention of Map.—To obtain a tolerably large scale plan of the area included in the map.

The map probably has no revenue value.

Special note.—See special note at end of description of Map 55 of the new atlas. See page 30 of this Memoir.

56. South-west Bihar.—*Title.*—"A map of the south-west part of Bahar, containing the Sircours of Rotas, Shawabad and part of Bahar."

Number in new atlas.—Plate 40.

Scale.—5 miles to 1 inch.

Size of map.—40" by 26".

Signed.—By Rennell.

An original map on thick drawing paper.

Area covered.—District of Shahabad and portions of districts Gaya, Patna and Palamau—the whole area is in Bihar and Orissa.

Surveyors.—Du Glos, Richards, Rennell and Huygens.

"The country lying between the Soane and Caramnassa rivers as also the roads from Patna to Daodnagur, and from Patna to Moneah, and the course of the Soane below Daodnagur by Lieutenant Russell."

"Serrio Cotumbah and in general the lands lying to the west of the Ghyah river, and north of the parallel of that town by Captain Richards."

"The remainder of the inland parts, and the course of the Soane from Hager to Daodnagur by DuGlos."

"The Gauges from Benares to Patna by Captain Huygens."³

Methods used.—Richards and DuGlos probably used the same methods of survey as Rennell. There is no inference possible as to the methods used by Russell and Huygens.

Date of Survey.—1767-1771 The map was drawn by Rennell in 1773.

Fitting points for comparisons.—Selected and village sites only.

State of preservation of map.—Requires slight repairs.

Intention of map.—To obtain a tolerably large scale map of the area included in this map.

¹ All the maps described in this section are in India Office Map Catalogue 1878, p. 162, I. A. C. 13 1st series. For limits of maps see index map No. II.

² These details are obtained from Rennell's introductions to India Office Map, Catalogue, I. A. C. 13, Series first and third, pages 162 and 163 of that Catalogue.

³ See Rennell's introduction to I. O. Map, Cat. I. A. C. 13, 1st and 3rd series, p. 162 and 163.

The map probably has no revenue value.

57. South-east Bihar.—*Title*—"A map of the south-east part of Bahar, containing part of Sircaurs Bahar, Curruckpour, Boglypour, Curruckdea, etc., with the passes of Rajemal and part of Rampur."

Number in new atlas Plate 41 (in 2 parts).

Scale.—5 miles to 1 inch.

Size of map.—37" by 29".

Signed—By Rennell.

An original map on thick drawing paper.

Area covered.—South Monghyr, Sonthal Parganas, South Bhagalpur, are portions of Birbhum and Hazaribagh. The whole area is in Bihar and Orissa.

Surveyors.—Rennell, Richards, DuGlos, Camac, Carter Ironside and Morrison.

"The country to the west of the meridian of the city of Bahar, the Beastazary Purgannah and along the Curruckpur Hills to Monghyr, with the course of the Ganges between Patna and Monghyr by DuGlos." "The country between the meridian of Bahar and Beastazary, the districts of Curruckdeah, Serampour, Boglipour and Colgong by Captain Richards."

"The course of the Ganges from Mongyr to Rajemal by Richards and Rennell." "Here were the roads from thence to Bogaryet and Durrumpour, and the Chabki and Palgunge Passes by Captain Carter." "The road from Serampour to Ayturals by Colonel Ironside."

"The sketch of the Road through Ramgur by Captain Camac. That through the hills to Patchwarry by Captain Morrison."¹

Methods used.—Rennell, Richards, and DuGlos probably used similar methods (see Rennell).²

No details are forthcoming regarding Ironside's or Morrison's methods.

Date of Survey—1766-1770.

Date of map.—1773.

Fitting points for comparisons.—Selected town and village sites. Considerable difficulty may be found in attempting to make accurate comparisons or in relaying all except occasional portions of this map. See special remarks below.

State of preservation of the map.—Requires slight repairs.

Intention of the map.—To obtain a tolerably large scale plan of the area depicted.

Special remark.—If this map is used for relaying the course of the Ganges for the portion about four miles west of Colgong to about eleven miles east of that place, it should be used in conjunction with India office Map, Catalogue 1878, A. X 41, p. 109. The scale of that map is 2 miles to 1 inch, and it appears to be an original from which the map under discussion was partially compiled.²

58. Eastern Bihar.—*Title*—"The provinces of Purneah and Rajemal, with the Purgannahs of Surore and Maldah or Rokunpour."

Number in new atlas.—Plate 42.

Scale.—5 miles to 1 inch.

Signed—By Rennell.

An original map on thick drawing paper.

Area covered.—Purneah district and a portion of the Sonthal Parganas of Bihar and Orissa, and part of Malda of Bengal.

Surveyors.—Rennell, Richards, Huygens and Adams.

"That part of Purneah, Rajemal, etc., lying west of the Mahananda River by Captain Richards, and that on the east by Captain Rennell."

"The eastern side of the Rajemal hills by Captain Huygens, the western side of Captain Richards."

"The Mahananda River from Mahrajunge to the Ganges, and the Dummock and Calendry nullahs by Captain Adams."

¹ See Rennell's introductory note to this series.

² This map has not been considered of sufficient importance to be copied and included in the new atlas. The map is perhaps the only fragment remaining of a series of maps of the Ganges above the Jellinghi take off. See Note A on index map No. 1.

³ Page 38 of this memoir.

Methods used.—Rennell, Richards and Adams probably used the same methods.

No details are forthcoming regarding Huygens.

Date of Survey—1767—1773.

Date of Map.—1775.

Fitting points for comparisons.—Selected terms and village sites. The Hills are probably very inaccurately mapped.

State of preservation of Map.—Good, but slight repairs required.

Intention of Map.—To obtain a tolerably large scale plan of the area included in the map.

Special note.—For the river portion near Colgong, see special note regarding Map 41 of the new atlas, page 22 of this memoir.

The revenue value of the map is very doubtful.

59. North-West Bengal.—*Title*—"The Provinces of Dinagepour and Goragot¹ with the Purgannahs of Maldwar, Surroopour, Islamabad, Shilberis, Jangipour, Mosheedah, Poostole and Barbuckpour."

Number in new Atlas.—Plate 43.

Scale—5 miles to 1 inch.

Size of Map.—40" by 26".

Signed by Rennell.

An original map on thick drawing paper.

Area covered.—Dinajpur and Bogra districts and the south of Rangpur—all of Bengal.

Surveyors.—Rennell and Richards.

Rennell surveyed the whole area, except the roads from Malda to Dinajpur, and from Dinajpur to Hintabari, which are by Richards².

Methods used.—Almost certainly Rennell's own methods. Practically the whole area is based upon route surveys.

Date of Survey.—1767—1771.

Date of Map.—1772.

Fitting points for comparisons.—Probably only selected town and village sites.

State of preservation of Map.—Good, but needs slight repairs.

Intention of Map.—To obtain a tolerably large scale map of the area depicted.

Special note.—This plate is of very great importance in the study of river movements. Since it was made the main waters of the Tista River have been diverted from the Ganges to the Brahmaputra River. There is no probable revenue value to the map.

60. Cooch Behar, Goalpara, etc.—*Title*—"The Provinces of Rangamatty,³ Rungpour and Coos-Beyhar with the adjacent Purgannahs of Baharbund and Bittreburd and part of Bootan".

Number in new Atlas.—Plate 44 (in 2 parts).

Scale.—5 miles to 1 inch.

Size of Map.—40" by 26".

Signed by Rennell.

An original map on thick drawing paper.

Area covered.—Jalpaiguri (Bengal) and Goalpara (Assam) Districts with their Duars, the latter then being in Bhutan. Cooch Behar State and North Rangpur district of Bengal.

Surveyors.—Rennell, Martin and almost certainly by Richards. Rennell gives himself credit for the whole survey, except Cooch Behar, but his diary shows that Richards was present for a part of the time occupied in the survey⁴. Martin surveyed Cooch Behar, but portions of it were amplified later either by Rennell or Richards.

¹ Bogra

² See Rennell's introductions to India Office Map Catalogue I. A. C. 13, 1st and 3rd Series. Pages 162 and 165.

³ Goalpara of Assam.

⁴ See Rennell's diary for February 1766. On page 175-Mem: As: Soc: of Bengal, Volume III. No. 3, 1910 Rennell states "Ensign Richards was sent in the beginning of May (1766) to finish the Survey of the Curesa River and the Rangamatty country."

Only the more remarkable hills between Sidli (Goalpara and the Upper Tista River were fixed "accurately" from bases. Between the Lower Tista River and Buxa Duar the hills were "accurately fixed". Rangamatty east of the Brahmaputra and Káraibari (Goalpara) are admittedly not accurately surveyed¹. The additions to the map made after it was first drawn, have been pasted above the old and omitted details, on thin paper. The drawing is by Rennell's own hand. It is quite probable that these additions were made by Rennell after he completed the first draught in 1774, but there is no evidence as to exact date of the survey which induced the corrections².

Methods used.—There is no evidence regarding Martin's methods. Rennell and Richards probably used the same methods.

Date of Survey—1765—1773. (This does not appear to include the corrections referred to above.)

Date of Map.—1774. - The corrections were probably added later.

Fitting points for comparisons.—The map is rather a patch work of different system of survey, and comparisons will need great care. Doubtless some town and village sites are mapped accurately enough to give a basis for comparison.

State of preservation of map.—Good, but the corrections are pasted on very loosely and are liable to damage.

Intention of the Map.—To obtain a general map of the area depicted.

Special note.—The map has a special value in river movement questions in the Duars area it will require very special consideration and weighing, before the courses of rivers are accepted as correct or incorrect. These Duars rivers are very unstable in course, and the reasons for their instability have not yet been fully examined. The same remarks apply to the same rivers (but in less degree) when they leave the talus slopes below the Himalaya and enter the plains of Cooch Behar, etc. A very important item in the maps is the present course of the Tista River. It will be observed that Rennell marks a Tista Creek as existing continuously to the Brahmaputra in his time. The existence of this Creek at that time was referred to by Fergusson in 1863.

If this map is used for revenue purposes it is probably only for the course of the main Brahmaputra that results of any value will be obtained. Even then it is essential that the map described here be used in very close conjunction with maps 22, 23 and 24 of the new atlas (India Office Map Catalogue, page 117, A. XIII 5 maps). These are on a larger scale (2 miles=1 inch).

Somewhat mutilated copies of this map exist. They should on no account be used. At their best they are hand-made copies of copies, and in some cases "copies of copies of copies."

61. Sylhet and Dacca.—*Title.* "The Province of Silhet and Northern part of Dacca with the Purgannahs of Jaffiersi, Badju, Torroff, Bejura, etc."

Number in new Atlas—Plate 45 (in 2 parts).

Scale.—5 miles to 1 inch.

Size of Map—40" by 27".

Signed by Rennell.

An *original* map on thick drawing paper.

Area covered.—The north and east of Mymensingh district, and Dacca or Bengal, and the Sylhet and Cachar districts of Assam.

Surveyor.—Rennell.

Methods used.—Rennell's methods.

*Date of Survey*¹.—1768—1771.

Date of Map.—1772.

Fitting points.—Town and village sites used with considerable circumspection.

State of preservation of Map.—Good, but needs slight repairs.

Intention of Map.—To obtain a general map of the area depicted.

Special note.—The course of the old main Brahmaputra is also given by Rennell on India Office Map Catalogue—page 117, A. XIII. 3. (5 plates)³ Scale

¹ See Rennell's introduction to I. O. Map Cat. pages 162 and 163, I. A. C. 13, 1st and 3rd Series.

² The additions are not shown on the map given in the new atlas. This is immaterial because Plate 44 of the new atlas shows exactly the field state in which Rennell left the original of that map.

2 miles-1 inch. Such of these plates as refer to this area take precedence of the map described here, but may have to be used conjunctively in making comparisons.

The map has value for river movement investigation, and may have revenue value if used in conjunction with the corresponding and larger scale river plates.

62. Dacca and Tippera—*Title*.—"The southern part of Dacca and low lands of Tippera, with the islands in the mouth of the Ganges."

Number in new Atlas.—Plate 46 (in 2 parts).

Scale.—5 miles to 1 inch.

Signed by Rennell.

An *original* map on thick drawing paper.

Area covered.—The south of the Dacca district; Noakhali and Bakarganj districts. The north-west corner of the Chittagong and the east side of the Faridpur district. The plains area of the Tippera district. All of Bengal.

Surveyors.—Rennell, Ritchie, Martin and Richards.

Methods used.—Rennell and Richards doubtless used the same methods.

For Ritchie's methods see "Ritchie";⁴ of Martin's methods no details are known.

The Ganges country lying to the east of it were surveyed by Rennell. The country west of it by Martin. The rivers by Richards and Rennell. The coast line by Ritchie.

The east side of Tippera is admitted² to be vaguely depicted.

Date of Surveys.—1764—1773.

Date of map.—1772.

Fitting points for comparisons.—Selected town and village sites. Great care will be needed in using portions of this map.

State of preservation of Map.—Good, but slight repairs are required.

Intention of map.—To obtain a good general map of the area depicted.

Special note.—Plates 48 and 49 of the new Atlas overlap this map on the west side. They should be used conjunctively.

Plates 5 onwards of the new Atlas (Rennell's Ganges River Series), India Office Map Catalogue, pages 101-102, AX 3, etc., show that river on far larger scales.

Plates 15 to 19 of the new Atlas (Megna Series) show that river on larger scales. See also Plate 20 of the new Atlas. See also special Note (V) to Map 49 of the new Atlas regarding a portion of the course of the Ganges. All the above must be used conjunctively for revenue purposes, but for the study of river movements, the plate described here will probably suffice.

63. Chittagong—*Title*.—"The Province of Chittagong divided into Chuklas."

Number in new Atlas.—Plate 47 (in 2 parts.)

Scale.—3 miles to 1 inch (note the change in scale from 5 miles to inch).³

Size of Map.—40" by 26".

An *original* map on thick drawing paper.

Area covered.—The Chittagong district, but not all the hilly area. Part of Sandip Island. All of Bengal.

Surveyors.—Richards, Ritchie and Plaisted. Plaisted mapped the Chittagong River.

Ritchie the rest of the coast line, and probably lands quite close to the coast line.

Richards mapped the rest.

Methods used.—Richards probably used Rennell's methods.

For Ritchie and Plaisted's methods see special notes under those names.⁴

The hill limits are probably very doubtful indeed.

¹ Maps 21, 22 and 23 of the new Atlas. For descriptions see page 15 of this memoir.

² See Rennell's introduction to India Office Map Catalogue, pages 162 and 163, I. A. C. 13 1st and 3rd Series.

³ See Rennell's introduction, to India Office Map Catalogue, page 161 I. A. C. 13, 1st Series, where he states that the Chuklas were too small to be shown on the smaller scale. This must not be taken to mean that Chukla boundaries are correctly mapped, or that all chuklas are shown.

⁴ Page 43.

Date of Survey.—1761 (Plaisted) to 1772.

Date of Map.—1773.

Fitting points for comparisons.—It is doubtful if any attempt at accurate comparison is possible. Only a careful analysis will settle that point, and it need not be made until a case of sufficient importance to warrant close comparison arises.

State of preservation of Map.—Good. Requires slight repairs.

Intention of Map.—To obtain a generally useful map of the area depicted. The revenue value of the map is extremely doubtful.

64. Sunderbans Water Routes.—*Title.*—"A chart of the Sunderban rivers in which the Baliagot and Sunderbund passages are both accurately described."

Number in new A las.—Plate 48.

Scale.—5 miles to 1 inch.

Size of Map.—39" by 26".

Signed by Rennell.

An original map on thick drawing paper.

Area covered.—Calcutta and Saugor Island on the west to Dakhin Shahbazpur. Showing navigable channels through the lower delta, with some soundings.

Surveyors.—Ritchie, Richards and Martin.

The coast and Sunderbans (lower portions) by Ritchie, except the rivers Badar, Posseah, Bolah, Charcolly, Calliocotty and Minedah; the creeks Angaryah and Guzaryah and the passage from the Marjallah River to Charcolly; these rivers surveyed by Captain Richards. The balance by Captain Martin, but he only appears to have surveyed the details along the northern fringe of the map.

Methods used.—Richards, doubtless used Rennell's methods. No details are known regarding Martin's methods. For Ritchie's methods, see "Ritchie" (page 38).

Date of Survey.—1769—1773.

Date of Map.—1773.

Fitting points for comparisons.—Comparisons will probably have to be based up a selected bends in minor rivers. No accurate comparison of the delta face (*i. e.*, coast line) is likely to be possible.

State of preservation of Map.—Good, but repairs required along the edges, and to a large tear across the map.

Intention of Map.—To show clearly the navigable waterways of the lower delta.

Special remarks—

- (1) The original map shows the main Sunderban river route in red dots; and the Baliaghat passage in green dots. In the reproductions both are shown by black dots. The Baliaghat passage is that on the north side of the map from Calcutta, *viz.*, the Salt Lakes, Doobypur and Culna, to the Charcolly River. The other passage is the Sunderban passage.
- (2) The map overlaps plates 46, 49 and 52 of the new Atlas.
- (3) The revenue value of the map is doubtful. For revenue purposes Plates 4 and 5 of India Office Map Catalogue, page 548 II. AC. 20 arp best used.¹
- (4) For river investigation purposes, the map is valuable, since it shows changes that have occurred in the relative importance of water distributaries.
- (5) Soundings shown are probably those given by Ritchie. See "Ritchie" on this point.
- (6) The plate is practically the same as Plate XX of Rennell's 1781 Atlas, but it shows more detail than that map, and should supersede it.

¹ These are Rennell's copies of Ritchie's original survey of the Delta free. As the work is Ritchie's it is not included in this memoir. If copies are required application should be made to the Director of Surveys, Rengal.

65. Nadia Rivers and Padda River tracts.—*Title.*—"The Provinces of Kishanagur, Jessore, Boosnah and Mahmudshi; with part of Dacca and Rajshy, comprehending the habitable part of the tract of country, situated between the arms of the Ganges."¹

Number in new Atlas.—Plate 49 (in 2 parts).

Scale.—5 miles to 1 inch.

Size of Map.—39" by 26".

Signed by Rennell.

An original map on thick drawing paper.

Area covered.—Murshidabad, Jessore, Krishnagar, 24-Parganas, Khulna and portions of the Faridpur and Bakarganj Districts. All districts of Bengal.

Surveyors.—Rennell, Martin, DuGlos and Richards.

"The Rivers Ganges and Hooghly; the Comer and Chanduah Creeks and the road from Calcutta to Hajygunge by Captain Rennell. The Jellinghee, Mudamutty and Burashee Rivers, and the road from Mahmudpur to Culna and thence to Mirjanagar and Bajitpour by Captain Richards."

"The Cossimbazar River by DuGlos."

"The remainder by Captain Martin."²

Methods used.—Rennell, Richards and DuGlos probably used the same methods.

No details are known regarding the methods used by Martin.

Date of Survey.—1764—1772.

Date of Map.—1773.

Fitting points for comparisons.—Probably only selected towns and village sites.

State of preservation of Map.—Good, but slight repairs required.

Intention of Map.—To obtain a tolerably large scale map of the area depicted.

Special remarks—

- (i) This plate probably has little revenue value. It may be of conjunctive help in the use of Rennell's Ganges River Plates. numbers 1 et seq. of the new Atlas (India Office Map Catalogue, pages 101 and 102-AX 3 onwards), which are on far larger scales.
- (ii) For river change investigation the map has considerable value, or at least will have it at some future time.
- (iii) A portion of the area shown is one in which some of the most difficult drainage and sanitary problems of Bengal present themselves. This area is that in which the opening up of the Padda River, at the expense of the Upper Hooghly feeders, has resulted in a lack of silt deposition and regular flooding. Although no levels were taken by Rennell his maps may easily afford help in drainage and sanitary problems.
- (iv) Although remnants of Rennell's Creek Series of Maps exist. (India Office Map Catalogue, pages 103, and 104-AX 23, etc.)³ I do not think that those creek maps have any value for any purposes (except perhaps in the soundings shown on some of them) greater than that of the map described here.
- (v) The Ganges River along the line A B on the map changed to that course after map 46 of the new Atlas was constructed.⁴
- (vi) This map overlaps Plates 46 and 48 of the new Atlas.

66. Middle Bengal.—*Title.*—"The Province of Bettowiah in North Division of Rajshy with the Purgannahs of Attya, Chaudmahaly, P. & C. Patladah, Burbazzo Shilberis, Jaffiersi and Lu-keppur"

¹ I.e. the main Ganges (Padda and lower Jamuna) from Jel' near Attya to the sea.

² I.e. Bhagirathi and Hooghly on the west.

³ See Rennell's introduction to India Office Map Catalogue.

⁴ See pages 17 to 19 of this memoir.

⁵ North west of Haldighati.

Number in new Atlas.—Plate 50.

Scale.—5 miles to 1 inch.

Size of Map.—40" by 26".

Signed by Rennell.

An original map on thick drawing paper.

Area covered.—Portion of Rajshahi District, with the Pabna and Bogra Districts, and West Mymensingh. All areas in Bengal.

Surveyor.—Rennell surveyed all but the road from Pabna to Chatmol and thence to Surda. The surveyor's name for these roads is not given.²

Methods used.—Rennell's, except perhaps for the roads mentioned above.

Date of Survey.—1769—71.

Date of Map.—1772.

Fitting points for comparisons.—Selected town and village sites.

State of preservation of Map.—Good, but slight repairs needed.

Intention of Map.—To obtain a general map of the area depicted.

Special notes.—The low-lying area on the south-east of this map is more accurately depicted on India Office Map Catalogue, page 162 I AC. 13, 1st Series Map XVIII¹ (dated 1775).¹

The map is valuable in revenue and river movement questions over a great part of the area it covers.

For revenue cases Plates 49 and 51 of the new Atlas overlap this map and should be used in conjunction with the large scale maps of Rennell's Ganges Series, India Office Map Catalogue, page 101 AX 3, etc., *et seq.* (Plates 1 *et seq.* of the new Atlas.)

67. Middle Western Bengal.—*Title.*—"The Provinces of Birbhoom and Rajeshy, with the Purgannahs of Chunacally, Futtasing. Sultanabads, etc."

Number in new Atlas.—Plate 51.

Scale.—5 miles to 1 inch.

Size of Map.—40" by 26".

Signed by Rennell.

An original map on thick drawing paper.

Area covered.—Birbhum, Murshidabad (South Rajeshy) and South Malda Districts of Bengal, and the east of the Sonthal Parganas of Bihar and Orissa.

Surveyors.—Rennell, Huygens, Carter, Richards and DuGlos.

"The Ganges, and all the lands between it and the Mahananda River by Captain Richards. The road from Ondinulla through the hills by Patchwarry, Comerabad and Deugurh by Captain Huygens."

"The road from Deugurh to the Chacki River by Captain Carter, the Cossimbazar River by DuGlos and the remainder by Captain Rennell."²

Methods used.—Rennell, Richards and DuGlos probably used the same methods. No details are forthcoming regarding the methods adopted by Huygens and Carter.

Date of Survey.—1769—1771.

Date of Map.—1774.

Fitting points for comparisons.—Selected town and village sites.

State of preservation of Map.—Good, but slight repairs required.

Intention of Map.—To obtain a general map of the area depicted.

Special Notes.—(i) The area includes portions of the Ganges shown on plates 42 and 50 of the new Atlas.

(ii) For larger scale plans of the Ganges see Rennell's Ganges River Series. India Office Map Catalogue, page 101 AX 3, *et seq.* (Plates 1, *et seq.* of the new Atlas).

(iii) Rennell's Creek Series. India Office Map Catalogue, page 102 AX 23, etc., should not be used for revenue cases. (Plates 26 to 32 of new Atlas.)

¹ Plate 56 of the new Atlas.

² See Rennell's introduction to India Office Map Catalogue, page 162 I. AC. 13, 1st series.

- (iv) For more reliable topography of North-West Birbhum, and certain other changes compare with India Office Map Catalogue page 163, 1 AC 13. Map XVII. (Plate 55 of the new Atlas), which is dated 1775.

Before the map described here is used practically consideration of the above map is essential.

68. Calcutta and Country west, south and north.—*Title* to Plate 52, which is the western sheet of Map XV. The Provinces of Midnapur, Burdwan, Hooghly, Bissunpur¹ and Pachete².”

Number in new Atlas.—Plate 52 (in 2 parts).

Plate 53 has no separate title, because it is an integral portion of plate 52.

Number in the new Atlas.—Plate 53 (in 2 parts).

Scale.—5 miles to 1 inch.

Size of Maps.—Each sheet 40" by 26".

Signed by Rennell.

Original maps on thick drawing paper.

Area covered.—Plate 52. Burdwan, Hooghly, Howrah, portions of the 24-Pargannahs, of Bankura, of Krishnagar, and of Midnapur. All of Bengal.

Plate 53. Purulia and portions of Ranchi, Balasore and of Murbhunj State of Bihar and Orissa. Together with those portions of Midnapur and Bankura not shown on Plate 52.

Surveyors.—Carter, DuGlos, Call, Portsmouth, Martin, Richards, Ritchie and Rennell.

Plate 52. “That portion of Burdwan, etc., lying between the Ajy, Damodah and Hooghly Rivers by Captain Rennell. The remainder of the Burdwan and Bissunpur Roads by Duglos, Carter, Portsmouth and Call.

The Company's lands and part of the Hooghly River by Martin.

The Sea Coast and Sunderbund Rivers by Ritchie.

The Damodah and Dalkisor Rivers by Portsmouth, and the Roopnarain and Carsai by Duglos.”

Plate 53. “Pachete by Carter and Portsmouth. The great road from Midnapur to Balasore, and thence to Pachete and Ayturah, by Portsmouth. The roads from Bissunpur and to Roypur, Coliapol, etc., by Lieut. Call and all the rest by Carter.”

Methods of survey used.—It will be observed that there is no much intermingling of different surveyor's work, regarding the methods of several (Carter, Call, Portsmouth and Martin) nothing is known with any certainty. that these plates are probably of little value except to show the general river distribution, and the relative importance of its components at the time of survey. In that respect the map is of considerable value in drainage, sanitation, and river hydraulic matters, particularly in the area exhibited on Plate 52.

Dates of Survey.—1767, 1769, 1770—1772 and 1774.

Date of Map.—1774.

Fitting points for comparison.—Town and village sites selected with particular care.

State of preservation of map.—Both sheets require slight repairs.

Intention of map.—To obtain a general map of the area depicted.

Special Notes.—(i) Plate 52 overlaps Plate 48 of this series.

(ii) It is very improbable that the maps have any revenue value.

69. North-west Chota Nagpur.—*Title.*—“Map of Rampur, Palamau, Chuta Nagpur, Toree and Koondah—1777.”

Number in new Atlas.—Plate 54.

¹ Bankura District of Bengal.

² Purulia District of Bihar and Orissa.

³ See Rennell's introduction to India Office Map Catalogue page, 163, 1 AC, 13, 1st series.

See also note on western edge of Plate 52 where the work of an unknown surveyor is referred to.

Surveyors.—There is doubt about the actual amount of survey work used as a basis for this map. It was compiled from "observations and remarks" by Captain Camac and Lieut. Fennell, apparently about 1773¹.

Scale.—10 miles to 1 inch.

The intention was to use double that scale, but probably the materials collected were too meagre to admit of the use of that scale².

Size of Map.—29" by 22".

Apparently an *original* map, but *unsigned*; it does not seem to have been drawn by Rennell himself.

Area covered.—Palamau, Hazaribagh and Ranchi Districts of Chota Nagpur.

Date of survey if based upon surveys.—About 1773.

Date of Map.—1777.

Condition of Map.—Good.

Special Notes—(i) It is probable that this map is of no value, except for general historical purposes.

(ii) The details on the map are given on the same scale on Plate VIII of the Atlases of 1780 and 1781. Also in the reprint of 1910. Plate VIII.

70. Bhagalpur, Monghyr, etc.—*Title.*—"Map of Boglipur, Monghyr and the Jungleterry Districts in general."

Number in new Atlas.—Plate 55 (in two parts).

Scale.—5 miles to 1 inch.

Size of Map.—34" by 29" with a small flap attached on the west side.

Original or copy.—The map appears to be an original, made by Rennell himself, but it is not signed.

Area covered.—The south of north Bhagalpur South Bhagalpur; South Monghyr; North and North-West Birbhum and the west of the Sonthal Parganas. All districts of Bihar and Orissa, except Birbhum, which is of Bengal.

Date of Map.—1775.

Special Note.—Portions of this map represent improvements on Plates 39 and 41 of the new Atlas.

For the area shown it should supersede the corresponding areas of those two plates.

The original of Plate 41 has been mutilated by corrections applied by cutting out portions of the face of the map and pasting on corrections from the back. These do not appear on the reproductions now made. There is no signed authority for the corrections on Plate 41 nor for its supersession by Plate 55, but there can be no doubt that the latter is authentic and as correct as information allowed, when it was drawn in 1777.

Surveyors.—Probably the same as for Plate 41 (page 22).

71. The Jhils of Middle Bengal.—*Title.*—"Correction of the maps of Dacca and Bettorriah, including the passage across the Jeels."³

Number in new Atlas.—Plate 56.

Scale.—5 miles to 1 inch.

Original or not.—The map is not signed, but I believe it to be an original by Rennell himself, and a particularly good example of his draughtsmanship.

Area covered.—The minor river, Creek and "bhil" distribution from Surdah to Panchor (about 24 miles south-west of Dacca).

Surveyors.—Not known, but almost certainly Rennell, or Richards, or both.

Methods used.—Probably those adopted by Rennell.

Date of Survey.—Just previous to 1775.

Date of Map.—1775.

Fitting points for comparisons.—Selected town and village sites.

Rennell's introduction to India Office Map Catalogue, page 163, I. A.C. 13, 3rd series.

Ditto ditto ditto 1st ..

The areas corrected are shown on Plates 46 and 50 of the new Atlas.

Special Notes.—

- (i) This map has no serious revenue value, but is important as historical evidence of the state of water distribution in the area depicted about 1775.
- (ii) The map should be used in conjunction with plates 46, 49 and 50 of the new Atlas for the main Ganges portion, should it be desired to use Rennell's Ganges Series. India Office Map Catalogue, page 101, Appendix 3, *et seq.* (Plates 1, *et seq.* of the new Atlas).

72. Cossimbazar Island.—*Title.*—"Map of Cossimbazar Island."*Not included in the new Atlas.**Scale.*—5 miles to 1 inch.*Size of Map.*—25" by 19".*Original or not.*—The map seems to be an original compilation by Rennell, but it is not signed.*Area covered.*—Murshidabad District and a portion of the Krishnagar District. Both district of Bengal.*Surveyors.*—The Hooghly Jellinghi and Ganges River by Major Polier some time previous to 1764¹. The remainder is probably by Duglos² but portions may be by Rennell.*Methods used.*—Polier's methods are not known. Duglos and Rennell probably used the same methods.*Special Note.*—This map is practically the same as Plate XI of the 1780, 1781 and 1910 reprint of Rennell's Atlas. These, however, also show a plan of the Battle of Plassey, 1757.

This plate is of no special value, since its details are given on Plate 49 of the new Atlas.

The map has not been reprinted, and there is no necessity to use it in supersession of Plate 49 of the new Atlas.

73. A small area near Calcutta.—*Title.*—"A map of the country between Sangral³ and Oulubaria."*Number in new Atlas.*—Plate 57.*Scale.*—2 inches to 1 mile.*Size of Map.*—25" by 21".*Signed by* Rennell.*An original map*—on thick drawing paper.*Area covered.*—The country on the right bank of the Hooghly River between Sankrail and Ulubaria, showing Forts Gloucester on the right bank, and Forts Granby and Hervey on the left bank.*Surveyor.*—Rennell.*Methods used.*—Not known, but they are not likely to be either Rennell's route or river survey methods.*Date of Survey.*—1770.*Date of Map.*—1771.*Fitting points for comparisons.*—Very few possible points are given on the map. Great care will be needed if comparisons are made.*State of preservation of Map.*—Good.*Intention of Map.*—The reason why the map was made is not clear, and I am unaware of any reasons that may render its use necessary.

The large scale used seems to point to a revenue object initially, and the map has been reproduced in case it may have such value.

The map has been included in the new collection because it is an unusual example of Rennell's work, although drawn by another.⁴**74. Dacca town and environs.**—*Title.*—"Map of the country 20 miles round the city of Dacca."*Number in new Atlas.*—Plate 58 (in 2 parts).*Scale.*—2 miles to 1 inch.*Size of Map.*—45" by 31".¹ Mem. As. Soc. of Bengal, Vol. III, No. 3, page 149.² See his record of services now in the India Office. (See page 40 of this memoir).³ Eight miles below Howrah.⁴ I. Brown, 1771.

Signed by Rennell.

An original map on thick drawing paper.

Area covered. See Title above.

Surveyor. Rennell.

Methods used. Probably route and river survey methods usually adopted by Rennell.

Date of Survey. 1771.

Date of Map. 1774.

Fitting points for comparisons. Doubtless these exist, but will need very careful search.

State of preservation of map. Good ; slight repairs required.

Intention of Map. Not known. It is possible that the map was made by Rennell merely for the general convenience of the residents of Dacca.

Special Note.—The map shows rather more area than its counterpart as Plate XII of the 1780, 1781 and 1910 reprint of Rennell's Atlas.

SECTION V.—MAPS BY RENNELL OF NO IMMEDIATE PRACTICAL VALUE.

75. Definition of practical value.—*Practical value* is here intended to assume reference to Bengal only ; to include duplicates and copies of maps already described ; maps on small scales which show areas for which larger scale maps exist ; and all sea charts since superseded by later publications. Within these limitations it is safe to say that it is *improbable* that the maps described briefly below will ever have any practical value.¹ The maps, however, are described briefly here because it is not possible for any individual to say finally that any particular map will *never* have a practical value.

76. Different types of so-called valueless maps.—The maps considered of no practical value are classified as follows:—

Part I.—Maps of India and surrounding countries.

Part II.—Small scale maps showing considerable tracts of Bengal.

Part III.—Maps which are really indexes to Rennell's more detailed surveys.

Part IV.—Large scale maps.

Part V.—Marine charts—

(a) Single charts.

(b) Charts covering more extended areas.

Part VI.—Other maps.

PART I.—MAPS OF INDIA AND SURROUNDING COUNTRIES, AND AREAS CONTIGUOUS TO BENGAL.

77. India—about 70 miles to 1 inch.—“A map of Hindustan.” Scale 69½ miles to 1 inch Dated 1782. This map is that which Rennell produced to illustrate the first edition (1783) of his *Memoir of a map of Hindustan*. The map was superseded by that used in the later editions, in which certain defects in the map were admitted by Rennell. The *Memoir* explains how Rennell constructed his map, which is admittedly the first successful attempt to depict the geography of India upon a scientific basis.²

A copy of the first edition of this work is in my own office library, and a copy of the map is bound up with it.

¹ Practical value assumes all probable requirements of Revenue, Geological, Sanitation and Drainage questions. Mere historical considerations are neglected in this report.

² This remark ignores D'Anville's famous map, but in no way belittles that famous geographer's attempt to make a map of India with far less data to draw upon than Rennell was able to accumulate. D'Anville's map was published in 1751 and an English version of it (by Herbert) in 1759.

78. India—about 46 miles to 1 inch.—"A map of Hindustan, or the Mogul Empire." Rennell, 1788, 46½ miles to 1 inch.

This map illustrated Rennell's second and third editions of his "Memoir of a Map of Hindustan," respectively published in 1788 and 1792. For some reason the 1792 edition of the Memoir is marked "Second edition," but I have copies of all three editions in my office library bearing the following dates on the title pages: 1783, 1788 and 1792.¹

There are two copies of Rennell's 46½ miles to 1 inch map of India in the India Office Map Room. See Catalogue of 1878, page 84-B IV-5 and page 464—Map 5 of Collection I AC. 12. Both maps bear the date 1788.

79. Maps upon the Geography of Western Asia.—"An Atlas to accompany a Treatise on the Comparative Geography of Western Asia, by the late Major James Rennell. Engraved by J. Walker. Published by Major Rennell in 1808, 1809, 1810 and 1811, and republished by Lady Rodd² in 1831"—

Contents.

No. IX. General view of the geographical construction of Western Asia, Part 1st. Between the Dardanelles and Shiraz; the Russian Frontier and Egypt.

No. X. Geographical construction in detail of Asia Minor, etc.

No. XI. (V) Syria and Northern Palestine; (B to E) Parts of Mesopotamia.

No. XII. (F. to H) charts of portion of the shores of the Black Sea and Archipelago; (I) a chart of the Euxine Sea to explain the Memoir on the Periplus of Arrian, etc.

A map of Western Asia in 4 sheets, 1809. A Map of the Comparative Geography of Western Asia, in 6 sheets, 1809.

Bound in a cover; size 25 inches by 20; in all 14 plates. This collection is catalogued in the India Office Map Catalogue of 1878 as II AC. 8, page 471.

80. Maps illustrating the Retreat of the Ten Thousand.—Maps to Major Rennell's Retreat of the Ten Thousand, etc. 1809-1815.

Sheets 2 and 3 in a cover, sized 21 inches by 15. Sheet 1 is missing.

For these two maps see India Office Map Catalogue, 1878. II Ac. C. 8, page 471.

81. Alexander the Great's marches.—Marches of Alexander the Great showing the Caspian Sea to Delhi.

This Map is a plate in Rennell's 1788 and 1792 editions of his "Memoir of a Map of Hindustan."

The two maps bear the dates 1788 and 1792.

82. Roads of India.—Main roads of India.

Dated 1788 and 1792 respectively and included in the last two editions of Rennell's Memoir of a Map of Hindustan."

83. Country between Delhi and Candahar.—The country between Delhi and Candahar, with the Indus River drainage system, 1792.

Included as a plate in the 1792 Edition of Rennell's "Memoir of a Map of Hindustan."

84. Tippoo Sultan's Estates.—"The Peninsula of India from the Kistnah to Cape Comorin exhibiting the partition of the territories of the late Tippoo Sultan according to the treaties of 1792 and 1799." Rennell, 1800.

Scale about 36 miles to 1 inch.

A copy of this map is in the India Office. [India Office Map Catalogue, page 84 (a) B IV 4 I.]

[At this time several other and similar maps were made which sometimes show different boundaries.]

¹ It may be observed that copies of these books are fairly easily obtained both in England and India. In India the price usually charged is far in excess of that asked in England.

² Rennell's daughter.

PART II.—SMALL-SCALE MAPS SHOWING CONSIDERABLE TRACTS OF BENGAL.

85. Bengal—Six and three inches to one degree.—"A set of General and Particular Maps of Bengal, Bahar, etc., by James Rennell, Surveyor-General, 1773¹ :—

Contents.

Some account of the construction of the maps.²

Bengal in four parts on the scale of six inches to a degree as fixed by the Directors.

Bengal, reduced to three inches to a degree."

Maps I to IV are what Rennell called "Particular" maps, and Map V is a "General" map.

These maps were superseded later by others more up to date, no originals or copies of which exist.

86. Bengal, etc.—Twelve miles to one inch.—"An actual Survey of the Provinces of Bengal, Bahar, etc., by Major James Rennell, etc. On two sheets. Scale 12 miles to 1 inch." See India Office Map Catalogue, page 163 BX. 23.

The map bears the date 1776, but was printed (see foot-note) in 1794. The map was copied by Drury from a map by Rennell then in the possession of the East India Company.

87. Bengal—Ten miles to one inch.—"A map of the Kingdom of Bengal, drawn from actual surveys and divided into Provinces; most humbly inscribed to the Honourable Court of Directors of the United Company of Merchants of England, trading to the East Indies, by their Honours' most devoted servant, James Rennell, 1768." Scale 10 geographical miles to 1 inch; size 40 inches by 46, Mss. I. O. Map Catalogue, page 169, BX 15.

This is an original map compiled by Rennell, but unsigned. It is mounted on cloth and is in good condition.

The map is one of Rennell's early efforts, and, when compared with his later maps of Bengal, is obviously deficient.

88. Bengal—Ten miles to one inch.—"A map of Bengal and Bahar with part of Orixa. Drawn from actual Surveys, by James Rennell, Surveyor-General, 1775." With a table of areas. Scale 10 miles to one inch; size 45 inches by 58 Mss.

This map appears to be a first compilation for Rennell's Atlas of Bengal (1780 Edition). The map is mounted on cloth and is in good condition.

(See India Office Map Catalogue, page 168 B X 16.)

89. Course of the Ganges River.—"A map of Bengal, Bahar, Oude, etc., exhibiting the course of the Ganges from Hardwar to the sea. Scale 24 miles to 1 inch." Size 32 inches by 43. I. O. Map Catalogue, page 168 B X 16.

This map is not an original, and was printed in 1786.

It is more *after* Rennell than *by* him.

The map is in a good state of preservation.

90. Cossimbazar Island.—Map of Cossimbazar Island.

Scale 5 miles to 1 inch.

The map is the original of Plate XI of Rennell's 1780, 1781 and 1910³ (reprint) Atlas.

91. Rangpur, Cooch Behar and Goalpara.—"Rangpur, Rangamatty, Cooch Behar with the adjacent purgannahs of Baharbund and Bittreebund and part of Boston." Surveyed by Rennell and Martin. Scale 5 miles to 1 inch (the scale given on the map is wrong).

This map appears at the end of the India Office Map Catalogue, page 163, I. A. C. 13 Collection. It is a copy made somewhat carelessly and should not be used.

Other copies of this map exist (Goalpara District Record-room, etc.), but neither the copy discussed here, nor any other but those reproduced this year, should be made use of.¹

92. Rennell's published small-scale Atlases of 1779-80 and 1781.—

The Atlas of 1781 was enlarged, to include 21 plates, but the first twelve are identical with the twelve plates of the 1780 Edition.

In 1910 the Surveyor-General of India reprinted the 1781 Edition, adding two plates to it. These are numbered in sequence to the 21 plates of the 1781 Edition.

In view of the fact that we now have available an issue of copies of Rennell's 5 miles to 1 inch plans of the whole of Bengal; it may be said that the atlases of 1780, 1781 and 1910 lose their value except in regard to the last two plates of the 1910 reprint. These are considered separately in the table below.

To save space in this memoir the three atlases are dealt with together. This entails the considering in some cases of three similar maps, made at different times, as one map. But it is maintained that is a better course to adopt than to describe what is to all intents and purposes the same set of maps, in three different places.

The plates contained in the three atlases are described in the table below:—

Description of the Atlases of 1780, 1781 and 1911 (reprint).

Plate No. in 1780 Atlas.	Plate No. in 1781 Atlas.	Plate No. in 1910 Atlas.	Scale.	Inscribed to	Description.	REMARKS.
I	I	I	10 miles = 1"	Francis Rennell	The Delta of the Ganges with adjacent countries comprehending the southern inland navigation.	With a plan of Samoolagur or Soomookgur Fort near Bankibazar.
II	II	II	Ditto ..	Brigadier-General Richard Smith.	The Jungleterry District with the adjacent provinces of Murshidabad and Bahar.	
III	III	III	Ditto ...	Sir Hector Munro, K.C.B.	A map of South Bahar including the course of the Ganges to Chunagur.	
IV	IV	IV	Ditto ...	Brigadier-General John Cailland.	A map of North Bahar.	
V	V	V	Ditto ...	Hugh Inglis ...	The Northern Provinces of Bengal with the Bhootan, Morung and Assam frontiers.	
VI	VI	VI	Ditto ...	Thomas Kelsall	The Low countries beyond the Ganges from the Mauldah river to Sylhet, comprehending the midland and eastern navigation.	
VII	VII	VII	Ditto ...	Henry Verelst ...	The Provinces of Bengal, situated on the West of the Hooghly River, with the Maharatta frontier.	
VIII	VIII	VIII	Ditto ...	Major Jacob ...	The conquered provinces, on the South of Bahar, containing Ramgur, Palamow and Chota Nagpur with their dependencies.	
IX	IX	IX	24 miles = 1"	Warren Hastings	Bengal and Bahar.	
X	X	X	Ditto ...	John Carter ...	A map of Oudh and Allahabad with part of Agra and Delhi, including the course of the Ganges to Hurdwar and the Maharatta frontier.	
XI	XI	XI	5 miles = 1"	Lord Clive ...	A map of the Cossimbazar Island with a plan of the battle of Plassey.	
XII	XII	XII	2 miles = 1"	.....	Plan of environs of the City of Dacca.	
...	XIII	XIII	6 miles = 1"	Sir Robert Backer	The Doo-ab, from Allahabad Kalpy.	

Plate No. in 1780 Atlas.	Plate No. in 1781 Areas.	Plate No. in 1910 ¹ Atlas.	Scale.	Inscribed to	Description.	REMARKS.
Atlas of 1780—Twelve plates.	XIV	XIV	5 miles = 1"	.....	The River Ganges from Allahabad to Patna.	With special plan of the Forts of Allahabad and Chunagurh (Chunar). With plans of the Forts of Patna and Monghyr and of the ruins of Gaur.
	XV	XV	Ditto ...	.....	The River Ganges from Patna to Surdah.	
	XVI	XVI	Ditto ...	.....	The Ganges from Surdah to the Callingonga, with the passage across the Jeels.	
	XVII	XVII	Ditto ...	.....	The Ganges from the Calligonga to its confluence with the Megna or Burrampooter and the Megna from thence to the head of the Luckia River.	With a section of the Jellinghi River bed.
	XVIII	XVIII	Ditto ...	Captain John Jones.	The Burrampooter from the head of the Luckia Bannar River to Arsam.	
	XIX	XIX	Ditto ...	.....	The Hooghly River from Nuddeah to the Sea.	With Balasore Road and plan of the attack of Oudanulla.
	XX	XX	Ditto	O. W. Boughton Rouse.	The map of the Sunderbund and Baliagot passages, with the principal communications.	
	XXI	XXI	.....	.....	A view of Oudanulla as it appeared before the principal attack in 1762 Chunung from the West as it appeared after the siege of 1764.	These are drawings engraved for the Atlas of 1781.
	XXII	XXII	50 miles = 1"	.....	Map of inland navigation(2).	
	XXIII	XXIII	.....	.....	Sections of the Ganges River showing the bed and method of oscillation of the River (3).	

23 plates
in 1910
reprint.

NOTES.—1. Reprint Atlas of 1910 (23 plates). The reprint purports to be a copy of an Atlas of 1783. The correct date is 1781.

(2) This map belongs to Rennell's "Account of the Ganges and Burrampooter Rivers"—Phil. Trans. 1781. This pamphlet was afterwards published separately, and as an addendum to the 1788 and 1792 Editions of Rennell's "Memoir of a Map of Hindustan." It never formed a part of an Atlas published by Rennell, and was erroneously included in the 1910 reprint at my own suggestion.

(3) See note (2) above. The same remarks apply.

The description of Rennell's Atlases on pages 164 and 165 of the I. O. Map Cat. 1878 are not correct. Each atlas consisted of the plates noted in this table, bound up in Folio, with a title, contents and index.

II A.C. 19—Page 164 is merely a collection of maps without title, contents or index, and is certainly no issue of the Atlas. The correct classification in the I. O. Cat. should be—page 161, II. A. C. 4. First and 2nd editions of the Atlas (2 copies of the latter—; all bound in leather. Page 161 II. A. C. 19 should be noted as a "Collection of printed maps by Rennell. At the end of collection II A.C. 19 are two printed maps of the E. I. R., 1859. These have no connection with Rennell and nothing but an historical value.

PART III—MAPS WHICH ARE INDEXES TO RENNELL'S LARGER SCALE WORK.

92A. Ganges River in Bengal 3 miles to 1 inch.—"A map of the Great River Ganges, from Jellenghee to its Junction with the Megna, including its several branches on both sides as far as they have been surveyed; together with the River Megna from Luckipour to the mouth of the Issamuty and the environs of the City of Dacca, 1767."

Scale 3 miles to 1 inch; size 27 inches by 53. Manuscript. Original.

This map is merely an index map.

The map is called a "reduced general map," and has no particular value. For the original map see I. O. Map. Cap. 1878, page 100 A. X. 1. Reprints were made in 1912, but are valueless and are not included in the collection of maps which illustrate this report.

93. River plate Dinajpur to the Ganges.—"A map of the Denospour or or Raagegunge River from its junction with the Ganges to Raagegunge,¹ containing near 200 miles of the course of the River." Surveyed in 1766 and 1767 by Messrs. Rennell and Richards.

¹ Dinajpur.

Scale 3 miles to 1 inch ; size 13 inches by 47. Manuscript. Original.

This map is merely an index map, and is superseded by those used in this report to illustrate Rennell's work.

The map is a "reduced general map," and has no particular value.

The map is in continuation of that described immediately above, on its north-west side. To fit the two lettering on one map must be placed wrong end up.

For the original see I. O. Map Cat. 1878, page 100, A. X. 2. Reprints were made in 1912, but are not included in the collection of maps which illustrate this report, as they have no real value.

94. Lower Megna and allied Rivers.—"A general map of the Megna and other Rivers, which form the nearest passage from Luckypour to Dacca in the dry season ; including likewise the Creek of Chiddypour or Luricule, which affords a short passage from the Megna to the Ganges. Reduced from the original surveys by J. Rennell, Surveyor, 1765."

With a plan of the British Factory at Dacca on a larger scale.

Size 20 inches by 27. Scale 2 miles to 1 inch. Manuscript. Original.

This again is an index map. For the original see I. O. Map Cat., page 102, A. X. 17. Reprints of this map were made in 1912, but are not included in the collection of maps which illustrate this report.

95. Other maps.—Much of Ritchie's work was redrawn by Rennell. Two sets of maps will be found under :—

(a) I. O. Map Cat., 1878, page 163, I. A. C. 13, 2nd Series.

(b) I. O. Map Cat., 1878, page 548, II. A. C. 20.

In this report, for convenience, these maps have been described under "Ritchie", since all but the actual drawing and compiling is his work. See "Ritchie", page 43 of this report.

PART IV.—LARGE SCALE MAPS.

96. The Ganges near Colgong—"Ganges No. 2 surveyed in June 1767." By J. Rennell, Surveyor. Scale 2 inches to 1 mile ; size 32 inches by 21. Manuscript. Original. I. O. Map Cat., page 109, A. X. 41.

This map shows about 15 miles of the Ganges, above and below Colgong in Bihar and Orissa. See special note regarding it, at the end of description to plate 41 of the new atlas (Rennell's 5 mile to 1 inch series) on page 22 of this report.

It is possible that this map may be of practical value to the Bihar and Orissa Government, but I have included it amongst the maps of no value in this report, because I am doubtful that it has practical value.

97. Junction of the Megna and old Brahmaputra.—"An exact survey of the Rivers Megna and Baramputrey, by James Rennell, Surveyor, No. 1 containing from the Issamutey to Nauldee Point, in distance $19\frac{1}{2}$ statute miles, May 1765." Scale 2 inches to 1 mile. Size 19 inches by 37 Manuscript. Original.

This map is a first and incomplete draft of plate 20 of the new atlas. (Rennell's Brahmaputra Series I. O. Map Cat., 1878, page 117. A. XIII. 1.)

The map described here is catalogued in the I. O. Map Catalogue of 1878 as A. XIII, 2, page 117.

PART V.—MARINE CHARTS.

98. Colymere Reef.—Part of Colymere Reef, surveyed, 1763-64. The map is dated 1782 and was drawn by Dalrymple.

See I. O. Map Cat., 1878, page 555, Map No. 72.¹

99. Camorta Bay.—Bay on the East side of Camorta Island by James Rennell, 1762.

Drawn by Dalrymple.

See I. O. Map Cat., page 556, Map No. 121.¹

¹ In the India Office in 1878. Not now traceable.

100. Sambellan Islands.—Sambellan Islands ; Malacca Strait by Henry Rennell, 1763.¹

Drawn by Dalrymple.

See I. O. Map Cat., 1878, page 556. Map No. 132.²

101. Other Charts by Rennell not traced.—According to Markham's Life of Rennell (page 39), other charts by Rennell existed in the India Office, but are not now traceable. If found their value could not be more than historical. Certain *general charts* by Rennell, compiled by him from Ritchie's and Plaisted's surveys survive. See "Ritchie," page 43 of this report.

See also I. O. Map Cat., page 579 (2nd map) for a chart of a portion of the Cornish Coast published by Rennell, 1793,³ but based on far earlier surveys.

PART VI.—OTHER MAPS.

102. Maps used for Illustration purposes.—It is natural to suppose that Rennell's services would be in demand for mapping work to illustrate important books. Thus Orme, the historian, was indebted to Rennell.⁴

Doubtless other writers made similar use of Rennell.

Thus probably there are many maps by Rennell, not included in detail in this report, which are actually by him, or after him.

For the purposes of general utility such maps can probably be neglected

SECTION VI.—NOTES ON RENNELL'S SURVEY ASSISTANTS AND HELPERS.

103. Number of persons whose work in Bengal was used by Rennell.—Including himself, Rennell's available records admit the use of surveys by sixteen other persons, besides those made by himself.

104. Rennell's methods of survey and projection.—The methods of survey used by Rennell are considered upon pages 1 to 4 of this Memoir. No reference is made there, however, to Rennell's system of projection for such maps as he projected.

The note below is transcribed from Rennell's introduction to his 5 miles to 1 inch maps of Bengal⁵ :—

"The projection answers to that of the plain Chart; the parallels of Latitude and Meridians making right angles with each other. This was found to answer best for Particular⁶ maps, but in the General⁷ map, the projection is such as shows the inclination of meridians and difference of Longitude, preserving at the same time the respective positions of places; and of course showing the quantity of superficies contained on that portion of the Globe which it represents."

Any assumption that either Rennell's Latitudes or Longitudes are correct is a mistake. I mention the point because they have been used, to my own knowledge, in a particular court, as a source of attempted identification of lands.

Rennell's projections may have an academic interest; but that have no other interest, so far as I am aware.

105. Boundaries shown by Rennell.—The subject of the accuracy or otherwise of Rennell's boundaries is mentioned in Section 1, Part 2 of this Memoir. Rennell's own comments regarding the boundaries on his 5-mile series (Plates 39 to 58 of the new Atlas) are as follows⁷ :—

"First then, the lines traced during a general survey, though at a convenient distance from each other for the purpose intended, do sometimes

¹ Markham gives this as one of James Rennell's charts. See page 39 of Markham's Life of Rennell.

² In the India Office in 1878. Not now traceable.

³ Rennell was an authority on Sea currents. An Ocean current near the south-west corner of England (Scilly Islands) is called after him.

⁴ See Markham's Life of Rennell, Century Science Series, Cassel and Company, 1901, page 50.

⁵ India Office Map Catalogue, 1878, Page 163. I. A. C. 13.

⁶ See page 1 for description of the terms "particular" and "general."

⁷ See Rennell's preparatory note to India Office Map Catalogue, 1878, page 163, I. A. C. 13.

fall without the boundaries of small districts,¹ by which they escape notice if the surveyor has no previous knowledge of their existence."

"Secondly; the Peasantry, from whom the knowledge of boundaries is chiefly derived, frequently use different names from those in the Government Books, for the districts they inhabit. Sometimes they join several pergannahs together, as in the south-west part of Dacca, where several pass together under the general name of Sundercool, etc."

"Lastly, the difficulty (at certain times) of procuring intelligence of any kind; as often happened in places where the natives either through fear, desert their habitations, or through obstinacy, refuse their assistance."

The comments quoted above were given by Rennell in defence of his own work which was said to pay too little attention to the accuracy of the boundaries he surveyed. The inference is that his upland surveys at any rate were expected to give details of revenue value. But Rennell states clearly in the above extract that his boundary surveys often failed to give exact revenue details, because his purpose was to make "General" maps. For a description of what Rennell aimed at in his "General" maps see the definition on page¹.

Thus as regards boundaries accepted by Rennell, it is quite clear that his boundaries were incidents of a general and not of a revenue survey, and as such are not to be considered either accurate or conclusive without evidence beyond that shown on his maps.

This is the view that has been upheld judicially (see Section I, Part 2), upon similar grounds.

Further details regarding Rennell's own views as to the necessity for accurate boundary surveys will be found under the instructions issued to Dawes and Pringle in 1776, for Surveys in the United Provinces (see below). Those instructions also probably throw light upon the methods which Rennell himself used during his own upland survey work.

106. Rennell's field books.—Practically nothing remains of Rennell's field books. There are a few fragmentary morsels in LaTouche's Edition of of Rennell's Diary,² but these may be taken to be of no practical value today.

107. Adams.—Captain John Adams was one of the Assistant Surveyors given Rennell by Mr. Verelst, Governor of Bengal, on 1st February 1767.³ He does not appear to have given Rennell much help, as Rennell only admits using his work in Plate 42 of the new Atlas.

Adam's methods were probably the same as Rennell used in his uplands surveys.

108. Call.—Call's work was used in the compiling of plates 52 and 53, and he cannot be looked upon as more than an incident in Rennell's surveys. No details regarding his methods of work are known to me.

109. Camac.—Captain Camac's "observations and remarks" were used in compiling Plate 54. It is probable that he was not a surveyor.

110. Carter. Captain Carter, then Lieutenant, was sent to Rennell, by Verelst, as an Assistant early in 1767. (See Adams paragraph 107 above).

His work was used by Rennell in Plates 41, 51, 52, 53 and probably in Plate 53.

His methods of survey would almost certainly be those used by Rennell.

111. Dawes.—Strictly speaking, Lieutenant Dawes should not be included here. He worked for Rennell, beyond the limits of Bengal, in 1776; it happens, however, that the instructions issued by Rennell to Dawes survive and these throw light on Rennell's own methods, and upon those of the assistants most intimately connected with him.

A digest of Rennell's instructions to Dawes is given below⁴ :—

(1) Certain main roads to be surveyed to admit of distances being used as a rough triangulation. Other roads to be estimated and put into the map approximately.

¹ Properties ?

² Mem. As. Soc., Bengal, Vol. III, Part 3, 1910.

³ Ditto page 186.

⁴ Instructions to Lieut. Dawes, (for Oude, Allahabad and Upper India) and to Lieut. Pringle (for Jungleterry, etc.) 1776. Bengal Consultations, 20th September to 30th December 1776. India Office Range 11, Volume 16.

(2) Courses of principal watercourses to be "laid down," *i.e.*, actually surveyed.

(3) "Describe" the face of the country distinguishing hills; woods; jungles; morasses and arable lands.

(4) "Remark" the positions of towns and villages; forts; passes; ghâts, fords and ferries and any other important features.

(5) Scale of field surveys to be 2 miles to 1 inch.

(6) To note the boundaries of parganas when they were crossed in the course of survey.

(7) Not to survey major boundaries in great detail.

"It is not intended that you should follow the minute windings of it, but only to describe the general direction of it, with such a degree of exactness as may be expressed on a scale of 5 miles to an inch."

(8) To record the depths of streams at crossing points.

(9) If difficulty occurs in tracing a main boundary, take a main line of bearing and observe for latitude at each end, whenever the boundary is nearly meridional.

(10) Observe latitudes at important places.

(11) Azimuths or amplitudes for finding magnetic declinations to be taken frequently with the instrument used for observing ordinary angles during the survey.

Rennell left India in 1777, but it is probable that he used Dawes' work in those sheets his published Atlases (1779-80 and 1781) which refer to this area.

112. DuGlos.—Rennell used the work of Luis DuGlos (sometimes spelled differently) in Plates 40, 41, 49, 51, 52 and 55 (?) of the new Atlas.

DuGlos appears to have been a versatile Frenchman. He joined the Army in Bombay on February 28th, 1753, and retired as Lieutenant-Colonel in 1772. He served in the Engineers, Artillery, and as a Surveyor in Bengal. He complained of slow promotion on account of his nationality.

DuGlos had four European or Eurasian assistants: John Edwards, John Barnard Chausour, John Gerofflee and Francis Sydra.

In 1765 he surveyed in Midnapur, Burdwan and the Mahanadi River neighbourhood, and, under Colonel Smith (in command at Monghyr), he surveyed portions of South Bihar and the Gandak River.

He cast cannons and mortars at Dinapore and is said to have built the old barracks in that Cantonment.¹

His methods of survey were closely allied to those of Rennell, if not identical with them. Details of a meagre description are given in his diary.

A strange thing about this diary is that it does not mention Rennell. A stranger thing is that DuGlos found rhinoceros tracks close to Monghyr.²

DuGlos' diary mentions the following surveys of which no original records are forthcoming:—

- (1) Rohtas Fort (Shahabad).
- (2) Roads from Rohtas to Monghyr.
- (3) Ganges River Monghyr to Patna.
- (4) Ghagra River.
- (5) Survey of Cossimbazar Island.

Probably Rennell used all these records in his 5-mile maps.

113. Fennell.—Lieutenant Fennell was associated with Captain Camac (*see* paragraph 109 above) in Chota Nagpur. The remarks made regarding Camac apply equally to Fennell.

114. Huygens.—Captain Huygens' surveys were used by Rennell for Plates 40, 42 and 51 of the new Atlas.

¹ The above details are taken from—

(a) Bengal, Past and Present, page 45, Volume V.

(b) Bengal Public Consultations No 11 of 17th December 1772.

(c) A diary by DuGlos whilst employed as a Surveyor near Monghyr. (India Office Map Catalogue, Volume II, Part I. Orme Collection.)

² The distribution of this animal in the delta in recent years is important since it seems to show a rapid consolidation of the lower delta. On the other hand these animals may have reached Monghyr from Nepal, where there are still many rhinoceros.

Huygens' name is not always spell the same way.

No details regarding the methods of survey used are known, but DuGlos mentions¹ meeting "Huygins" between Calcutta and Patna on October 27th, 1766, and there can be no doubt that such meetings resulted in technical discussion of a nature that would tend towards similar working, even if Rennell had not himself arranged the matter, which is possible and even probable.

That there was close collaboration in these surveys seems clear for DuGlos in his diary says that he met Carter on April 8th, 1767, and Richards on February 15th, 1768.

115. Ironside.—Captain Ironside was not one of Rennell's assistants. He was only responsible for certain details given on Plate 41 of the new Atlas and perhaps for some work on Plate 55. Nothing definite is known about his methods of survey.

116. Kyd.—Kyd's work was only used by Rennell in Plate 39. No details are known of his methods of survey.

117. Martin.—It appears that the famous Captain Claud Martin, Soldier and Calcutta Citizen, was the Martin associated with Rennell, but the point is not yet necessarily proved. Rennell used his work in Plates 44, 46, 48, 49 and 52 of the new Atlas and it is probable that the methods used by Martin were the same as those used by Rennell himself.

There exists an interesting map said to be by Martin, showing the Revenue Lands of Calcutta dated 1760 or 1764. The original is in the British Museum; and a copy is in the India Office.² The only other copy known to exist at the moment is a photographic copy in the upper hall of the Imperial Library, Calcutta.

This map is not described here, but it may be observed that Rennell may have made use of it in his 5 miles to 1 inch compilations (Plate 57 of the new Atlas.)

118. Morrison.—Captain Morrison's work was used by Rennell in Plate 41 of the new Atlas, and perhaps in Plate 51.

No details are known regarding his methods of work.

It may be remarked that several of the name Morrison (names not always spelled alike) have made surveys in Bengal. It is not easy to discriminate the work of each man, and already the names, and the work of each are becoming confused³.

119. Plaisted.—Some details of Bartholemew Plaisted's career are given in a foot-note of LaTouche's Journals of Major James Rennell. The foot-note is transcribed below:—

"Through the kindness of my friend Rev. W. K. Firminger, Editor of Bengal, Past and Present," I have been able to learn some particulars of the career of Mr. Bartholemew Plaisted. In 1748, being then Captain and Supercargo of the Ship Kent, he was appointed Engineer and Surveyor by the Council, and in 1747 prepared plans for the improvement of the defences of Old Fort William, his connection with which is fully set out in the late Dr. C. R. Wilson's work on 'Old Fort William in Bengal'.⁴ In a small book published by Plaisted in 1758, a Journal of his voyages from Calcutta to Bussora and thence across the desert to Aleppo and home (which Mr. Firminger has kindly placed at my disposal),⁵ is included his map of Bengal, with an 'Account of the countries, cities, and towns adjacent to Bengal' by a gentleman who resided there many years.' This map, which he states in the legend attached was collected from the best authorities, is not, it must be confessed, much if at all superior to Van den Broucke's map of 1667 in point of accuracy of detail and he is not referred to by Rennell in the

¹ See foot-note 1(c) on the prepage.

² India Office Map Catalogue, 1878, page 108 A. XI, 14.

³ India Office Map Catalogue, 1878, page 265, assigns a map to the Morrison referred to here, whereas the map was made by another of the same name.

⁴ Asiatic Society of Bengal Memoirs, Vol. III, No. 3, pages 95—248. See entry for February 2nd, 1765.

⁵ There is a copy of the book in the India Office Library (see page 68, Library Catalogue, Vol. I, 1888). It was published in 1767 and not in 1768 as stated in the foot-note quoted above. The India Office copy does not contain the map described by LaTouche.

Memoir¹ as one of the authorities for his map of Hindustan². From 1761 to 1765 Plaisted was employed on surveying the river and coasts near Chittagong with a salary of Rs. 1,800 a year, increased in 1765 to the emoluments of a member of Council (Wilson of Cit. Vol. II, pages 162, 164, 165, 172, 174). In July 1767 he was surveying at "Luckypore," but died in Calcutta in October of the same year."

Plaisted's map of Bengal, made in the period between the maps of D'Anville and Rennell, can have no practical value.

In addition to the work described by Mr. LaTouche, Plaisted also made surveys of the rivers of Sylhet.³ but his maps are no longer forthcoming, and evidently were not used by Rennell. From this it may be gathered that the maps were of little or no practical use.

Plaisted also made certain Marine charts which are no longer forthcoming, but which are mentioned on pages 555, 605, 607 and 608 of the India Office Map Catalogue, 1878. These charts are probably of no value or use now-a-days.

Plaisted's survey of the Chittagong River (used by Rennell for Plate 47 of the new Atlas) has not been preserved⁴.

Plaisted is also mentioned in this memoir, in association with Ritchie; see paragraph 124 below.

120. Polier—Rennell used Polier's survey,⁵ dated previously to 1764, in his map of Cossimbazar Island (Plate XI of Rennell's published Atlases of 1779-80, 1781, and the Surveyor-General's reprint of 1910).

References to Polier's career are given below.⁶ but nothing is known of his methods of survey, except that his results satisfied Rennell.

121. Portsmouth—Captain Portsmouth's surveys were used by Rennell in compiling Plates 52 and 53 of the new Atlas. Nothing is known regarding his methods of survey.

122. Pringle—Lieutenant Pringle surveyed in Jungleterry, etc., in 1767; but nothing is known in detail of his work, except that it was not used in Rennell's 5 miles to 1 inch maps.

His work, however, may have been used by Rennell in his published Atlases of 1779-80 and 1781. See Plate II of those atlases and the Surveyor-General's reprint of 1910. See also Dawes (Paragraph 111 of this Memoir).

123. Richards—Captain William Richards⁷ was more closely associated with Rennell in his actual surveys than any other surveyor. He was appointed Assistant Surveyor to Rennell on 1st January 1767, but he was acquainted with Rennell well before that date and apparently did survey work with Rennell as early as 1765. for in his Diary (11th December 1765) Rennell wrote that Richards and a Detachment of a Jemadar and 10 sepoys joined him at Jogighopa (Goalpara District) and on the 12th December "we set out by land to survey the countries between the Manas River and Rangainatti Town."

On the 26th February 1766, Richards was slightly wounded in the fight near Dinhatta. in which Rennell narrowly escaped death, being wounded as seriously as any man could be wounded without losing his life⁸.

Rennell used Richards' work for Plates 39, 40, 41, 42, 43, 44 (?), 46, 47, 48, 49, 51, 55 (?) and 56 (?) of the new Atlas.

¹ Memoir of a Map of Hindustan.

² Rennell, however, admits that he made use of some of Plaisted's surveys in his compilations. See below.

³ Asiatic Society of Bengal, Memoirs, Vol. III, No. 3, Entry June 9th to 16th, 1765.

⁴ There is a copy of it in Dalrymple's Charts (items 86 and 87, page 555 India Office Map Catalogue, 1878). On the same pages are references to several old maps of the Chittagong Coast which may be of value to the Chittagong Port Trust. I have not investigated those maps.

⁵ See Mem. As. Soc. Bengal, Vol. III, No. 3, page, 149.

⁶ (a) Foot-note to page 110 Mem. As. Soc. Bengal, 1910, Vol. III, Part 3.

(b) Page 49 of above.

(c) History of "Military Transactions in Indostan"—Orme, Vol. II, page 193.

(d) Buckland. Diet Indian Biography, page 339.

⁷ Mem. As. Soc. Bengal, 1910, Vol. III, Part 3, page 183, other references to Richards occur in this volume.

⁸ See page 49 of the Memoir.

Rennell always spoke highly of his assistant's energy and capacity, and there can be doubt that Richards followed his master's methods in all the surveys he executed.

124. Ritchie.—Captain John Ritchie was Hydrographical Surveyor to the East India Company from 1768-1785,¹ and possibly took over that appointment in October 1767, when Bartholemew Plaisted died in Calcutta.

Previous to 1767 or 1768 Ritchie was employed in the merchant service of the East India Company.

Rennell in his Analysis of the sources from which he obtained materials for his maps of Bengal, assigns portions of the area shown on Plates 16, 17 and 48 of the new Atlas to Ritchie. But there is reason to suppose that some of Plaisted's work may be included in the area². It is not possible, however, to substantiate this statement, or to give accurate details of the extent of each man's work. The probable *locale* of work done by Plaisted and at least partially used by Ritchie and by Rennell, is only the Chittagong Coast.

125. Ritchie's Methods of Survey.—There is very little record of the methods of survey used by Ritchie. In his "Remarks upon the Coast and Bay of Bengal 1775,"³ he says that with regard to the head of the Bay of Bengal from Cape Palmiras to the southern extremity of the Chittagong Coast, his maps are based upon "observations made in the course of a regular survey."

On page 32 of his "remarks" Ritchie wrote as follows: "The distance and form of the land, athwart the head of the Bay of Bengal, was determined by stationary vessels to form a chain of triangles, to connect the islands of Sundeep and Sagur."

How the sides of these triangles were measured we do not know, but it seems probable that the three sides were measured by sound, which was a system used frequently in that period.

This work at the head of the Bay was controlled by longitudes observed at Calcutta and Chittagong (the latter by Plaisted), but there is no record to show what difference Ritchie found between his triangulated values and those by observation for longitude. Nor can this matter be examined in detail since no field books or computations exist.⁴

On the whole, then, it may be taken that there is grave doubt about the value of Ritchie's coastal surveys from any point of view except that of very general and cursory comparisons. Any attempt to relay these coast maps would almost certainly give results far from the truth at the time the maps were made.

Besides the surveys of coasts, Ritchie also surveyed certain rivers (Haringhata, Hooghly and Megna). In these surveys he proceeded a considerable distance inland and he could not have used the method of triangulation which he adopted for his survey of the coasts of Bengal. But we do not know what methods he did use, and if the maps of the rivers just mentioned are used for comparisons a great deal of care, and expert help, will be required.

126. Remains of Ritchie's Work.—The remains of Ritchie's work falls under four distinct heads:—

- (a) Plans compiled by Rennell and used by him in making his Bengal maps.
- (b) A few large-scale plans of the entrance to the Hooghly River.
- (c) A large-scale survey of portions of the Haringhata River and its surroundings.
- (d) Single marine charts.

¹ On page 4 of his *Indian Surveys*, Second Edition, 1878, Markham gives Ritchie's period of employment as "from about 1770 to 1785." But Ritchie's maps still extant, date from 1768.

² See Plaisted (page 41).

³ India Office Map Catalogue Manuscript C. 10. The manuscript (in Ritchie's own handwriting) includes much interesting information of a general nature. Ritchie witnessed the total submergence of Sundeep Island on 16th October 1765 from his vessel which narrowly escaped destruction during that famous storm. The event is described graphically in his journal.

⁴ Rennell (*Memoir of Hindustan*, 1788, page 37), says that Ritchie's coast survey from Balasore to Chittagong was out by about 2½ miles when compared with Rennell's distance by inland survey.

These are dealt with in detail below :—

127. Plans, etc., by Ritchie compiled by Rennell and used by him in making his maps.—These maps (10 in number) are partially duplicates of Item II A. C. 20 on page 548 of the India Office Map Catalogue of 1878. The 10 maps are bound together and kept in a red leather-covered Atlas, which also contains the 21 original 5 miles=1 inch maps of Bengal drawn by Rennell. (India Office Map Catalogue 1878, page 163 I. A. C. 13, 2nd series). Thus Ritchie's maps (redrawn by Rennell) are numbered 22 to 31 in that Atlas.¹

The title-page of 10 maps after Ritchie is :—

“A set of General and Particular maps of the Bay of Bengal. Drawn from actual surveys taken in the years 1768, 1769, 1770 and 1771 by John Ritchie, Surveyor, and examined and compiled by James Rennell, 1772.” Descriptions of the maps are as follows:—

- (i) A small-scale chart of the Bay of Bengal with data for longitude. Covering the whole face of the Ganges and Brahmaputra delta, on Mercator's Projection. Soundings given. (Plate 22 of the India Office Atlas referred to above.)
- (ii) Mouth of the Hooghly River. Large-scale plan. Positions of 11 buoys shown. Channel Creek also shown with soundings. (Plate 23 of the India Office Atlas.)
- (iii) Coast of Coromandel, etc. (Plate 24).²
- (iv) Orissa Coast, etc. (Plate 25).²
- (v) Coast of Bengal, etc. (as No. 22; but on a larger scale. (Plate 26).²
- (vi) Coast of Aracan, etc. : (Plate 27).²
- (vii) Andaman Islands (Plate 28).²
- (viii) Nicobar Islands, on the scale of 10 miles to an inch, with enlarged plan of Noncowry Harbour, 1772. Plate 29.²
- (ix) Nicobar Islands 4 inches to one mile. Plate 30.²
- (x) Chart of the Eastern Ocean, 1759. Engraved. Mainly compiled from De Manneville's and D'Anville's work. Plate 31.²

Of these maps only Nos. 22, 23, 26 and 31 affect Bengal, and no copies are required.

The value of Nos. 22 and 26 is discussed later, but copies are not required in India because the details shown are duplicated on a larger scale in Map Nos. 4 and 5 of India Office Map Catalogue. (page 548) II. A. C. 20. Map 23 exists in duplicate form in several places. No. 31, so far as India is concerned, is apparently entirely from Monsieur D'Aprés de Manneville's work. This gentleman was the author of the *Neptune Orientale* (1745) and he is referred to by Rennell as Monsieur D'Aprés.³ On page X of the preface of Rennell's *Hindustan*, 1788, Rennell admits that he drew upon D'Aprés's map for some of his coast details of India. The portion of this map which has general interest to India is that lying between Longitudes 65° and 95° and from the Tropic of Capricorn on the North, to the Equinoctial line on the south.

It is interesting to note that on Map No. 31 the sites of Delhi and Goalpara and the position of a sea rock discovered in 1767 have been added in Rennell's own handwriting.

This map has no practical value to Bengal.

For the reasons given above the reader can pass over this set of maps as useless. But the maps are included here because they form a link in the chain which led Rennell to produce the first maps that showed the coast of Bengal at all accurately.

¹ The plates in the Atlas require some repairs, and the Atlas itself requires a stronger cover.

² Of the India Office Atlas—India Office Map Catalogue, 1878, page 163 I. A. C. 13, 2nd series.

³ Born at Havre 1717, died 1780. Sailor and Surveyor. Full name Jean Baptiste Nicolas Denis D'Aprés de Manneville.

128. Second series of Ritchie's maps used by Rennell.—The maps described in the last paragraph have been said to be partial duplicates of the India Office Collection II A.C. 20, page 548 of the 1878 Catalogue.

The title page to the maps contained in this brown paper-backed atlas (22 "by 26") is exactly the same as that for Ritchie's maps in the volume just described. But the atlas contains 9 plates only, and these are not all duplicates of the plates 22 to 31 of I. A. C. 13 (page 163 of the India Office Map Catalogue).

The plates are described below :—

- (i) Chart of the Bay of Bengal.
- (ii) Part of Coromandel Coast.
- (iii) Coasts of Goleonda and Orissa.
- (iv) Coasts of Bengal and Orissa (western side of Delta).
- (v) Coast of Bengal (eastern side of Delta).
- (vi) Mouth of Hooghly River surveyed in 1770.
- (vii) Coast of Bengal, Cuttack and Aracan.
- (viii) Nicobar Islands and Nuncovey Harbour (enlarge!).

Of these maps Nos. (iv) and (v) (scale 6 miles to 1 inch) may have some practical use and I propose that they be reproduced². Plates 22 and 26 of I. A. C. 13 should suffice for all purposes in the India Office, although their scale is smaller. Plate No. (vi) may be of use to the Port authorities, but there are duplicates of it, and it is proposed later on to transfer one of these to India.

129. Junction between Ritchie's, Rennell's and Martin's field surveys.—I venture to think that Captain Martin worked well south into Plate No. 46 of the new atlas. In other words, except for the Hooghly, Haringhata and main Megna rivers, no interior creek surveys used in Rennell's maps are based on Ritchie's surveys.

This supposition is supported by a remark made by Rennell on page 37 of his Memoir of Hindustan, 1788. There he states : " From Balasore, eastward to Chittagong, the distance has been determined by the inland survey ; and the figure of the coasts and inlets by Captain Ritchie's Seas Survey." Further Rennell's original index map showing areas assigned to the different surveys is on a very small scale.³

Again although Rennell, in the note which illustrates his index map just referred to assigns the survey of the Chittagong River to Plaisted, in the index map it is assigned to Richards.

Thus it is fairly clear that the index map is not closely reliable in the limits assigned to the work of the different surveyors.

LARGE-SCALE PLANS OF THE ENTRANCE TO THE HOOGHLY RIVER.

130. The Hooghly mouth.—In addition to Plate 23 of I. A. C. 13 (India Office Map, Catalogue, page 163) and Plate (VI) of II A. C. 20 (India Office Map, Catalogue, page 548) the following maps of the lowest Hooghly River by Ritchie exist in the India Office :—

- (i) A plan of the outlet of the River Hooghly from Calcutta downward as it was surveyed in the year 1770 by John Ritchie, Surveyor. Scale 2 miles to 1 inch ; size 36 inches by 22. Manuscript (India Office Map, Catalogue, page 105, I. VII 2).
- (ii) A plan of the mouth of the Hooghly River surveyed by John Ritchie, 1770. Scale 2 miles to 1 inch ; size 36 inches by 30. Manuscript (India Office Map Catalogue, page 105, I. VII 3).

¹ The case of those maps is being dealt with in the main case regarding the preservation of ancient copies of all old maps of Bengal that are not forthcoming in India, but that are required. This account only deals with Rennell's own work and only covers one section of the general investigation.

² In connection with the main case of these old records, and apart from the limited number of copies of Rennell's labours.

³ It has not been reproduced for that reason. The map is on the fly leaf to India Office Catalogue 1877, page 162, I. A. C., 3rd Series.

(iii) A plan of the entrance of the Hooghly River, particularly distinguishing the new channels and the position of the buoys, March 1783. By J. Ritchie. Scale 1 mile to 1 inch. Size 36 inches by 56. Manuscript (India Office Map Catalogue, page 105, I. VII 4).

I do not consider that any of these maps have any revenue value, but it is possible that No. (ii) may be useful to the Port Commissioners of Calcutta. If so, I suggest its being transferred to India, and such copies as may be required be printed there.¹

None of these three maps, except perhaps No. (i), are originals, and none of them are signed by Ritchie.

(IV) A LARGE-SCALE MAP OF THE HAR INGHATA RIVER AND SOME OF ITS SURROUNDINGS.

Survey of the Haringhata and Madhumati Rivers. No title. Surveyed in the years 1768 and 1769 by John Ritchie. Size 47 inches by 16 inches. (India Office Map, Catalogue, 1878, page 104 A X 34).

It is probable that this map has a revenue value,² and that if used with care, it is capable of being used for comparative purposes, although no field books or computations appear to exist. Nor are the methods of survey used known.

A full description of the map is recorded here.

Date of Publication.—Some date after 1775.

Scale.—Not given. It is, however, about 2.25 miles to 1 inch. No longitudes are given and the scale has been computed from a latitude scale given on the west side of the map.

Projection.—Not known.

Signed or not.—Not signed.

Original or copy.—A copy made some years after the actual survey.

Hand drawn or printed.—Hand drawn.

Type of paper.—Strong cartridge.

Area covered by map.—The Haringhata and Madhumati Rivers from the coast to close on North Latitude 23° , i.e., just above Hijli. Considerable details of the Bishkhali River up to Mirzaganj are also shown.

Map coloured or not.—Coloured.

Remarks on face of map and regarding it.—Various remarks are given. Those of interest or value are given below :—

(i) "In the month of May 1773, I sounded Madhumati River up to the Ganges; at that time there was 4 fathoms of water up as high as Gopalgunge after which the depths decreased gradually to about 8 feet, which was the smallest I found. There was not then more than one foot of water in the Jellinghee. This eastern passage may, therefore, be useful in some dry season."

(The soundings given on the map are those at low spring tides³.)

At Latitude $23^{\circ} 46'$ the Byrope River enters from the west and the following remark is entered: "This (Byrope River) passes by Runabad and Jessore Culna; it is part of the Bullygant Passage."

At Latitude $22^{\circ} 39'$ the Damodar River passes to the east and is said to communicate with the Padma *via* Barisal. "There is a depth of water from 4 to 7 fathoms throughout; and in the year 1769⁴ a ship of 600 tons burden was built at Modepore and went thence to the sea deeply laden."

Reasons for original survey.—Not given. The survey may have been undertaken in conjunction with Rennell's work. Ritchie in his remarks

¹ This will be considered in the main case of copying these old records.

² The question of when the map will be copied will be settled later. Here it is only necessary to point out the existence of this and its connection with Rennell's maps.

³ See Ritchie's Remarks, page 32 (I. O. Map Catalogue Manuscript C. 10).

⁴ In this year very little rain fell, so the rivers were probably very low. The lack of rain in 1769 caused the great famine of 1770.

hints that surveys of creeks and rivers on the coast were needed as precautionary measures against invasion by foreign powers from the sea.

Method of survey used.—Not known.

Soundings given or not and from what datum.—Soundings given. Datum low spring tides.

Condition of map distortions, etc.—Excellent, but age has probably introduced some distortion.

Fitting points for comparisons.—Fitting points may possibly be obtained from stream junctions or a few of the town or village sites shown. Great care must be exercised in using such points.

Field Books available.—No.

Correspondence available.—No, except Ritchie's "Remarks." (India Office Map, Catalogue, Manuscript C. 10).

Reports available.—See "Correspondence available."

SINGLE MARINE CHARTS.

131. Ritchie's Marine Charts.—Several charts by Ritchie are given on pages 555, 556, 606 and 607 of the India Office Map Catalogue of 1878.

None of these charts are forthcoming, and if they were, it is doubtful if they have any present-day value, since they must have been superseded long ago by more modern work.

132. General Remarks.—Ritchie and Plaisted were the only Marine Surveyors whose work was used by Rennell. Plaisted seems to have been used only for the area around the Chittagong River Mouths, but it is clear that he and Ritchie were associated before he surveyed that area. It is, therefore, quite possible that some of the surveys considered under "Ritchie" were at least partially done by Plaisted.

In any case I have thought it advisable to go into Ritchie's work in considerable detail in this memoir for two reasons:—

- (a) He was essentially a marine, and not a land surveyor.
- (b) His work was used largely by Rennell, and nobody can consider the true value of Rennell's maps without understanding exactly what work Ritchie did on and near the coasts of Bengal.

It is unfortunate that it is impossible to include the maps assigned to Ritchie or at least those relevant to this discussion in the new Rennell's atlas which illustrates this memoir. But it is out of the question to publish all relevant maps in sets of atlases such as that now published for Rennell's work. A line must be drawn somewhere, and I have felt compelled to draw it by excluding from the atlas companion to this publication, any map that is not absolutely essential to the understanding of Rennell's own work.

Should any map that is mentioned here as relevant be required hereafter application should be made to the Director of Surveys, and he will arrange for its production in due course.

SECTION VII.—RENNELL'S LIFE AND HIS WORK AS A GEOGRAPHER.

133. Rennell's early life.—Nearly all the details given in this chapter have been taken from the late Sir Clements Markham's life of Rennell¹ to which reference has been made already. It is close upon twenty years since that book was published, and Mr. LaTouche's researches have thrown much further light upon the subject.

Further, there are one or two points which at present are undecided, upon which I can throw some little light.

¹ The reader is very strongly advised to obtain this publication, which gives very lucidly, in a very complete manner, full details of Rennell's life, his aims, and his work. "Major James Rennell and the Modern English Geography"—Cassell & Co., Ltd., 1895.

² Copies of Rennell's letters, which were used by the Sir Clements Markham, are in the India Office and are well worth the students' notice.

James Rennell was born on December 3rd, 1742, at Chudleigh, near Exeter, and was the son of Captain John Rennell of the Artillery, who was killed in action in July 1747. After his demise the family estates were sold and young Rennell lived in limited circumstances with his mother and sister.

In 1752 Rennell was practically adopted by Gilbert Burrington, Vicar of Chudleigh. But for this man's largeheartedness and the kindness of his family it seems probable that the world have heard less of Rennell.

It is said that at the early age of 12, whilst still with the Burringtons, Rennell made a plan of Chudleigh and its neighbourhood.

In January 1756, Rennell entered the Navy, being rated as a Captain's servant. In actual fact he was a midshipman.

For about two years he cruised in the Brilliant Frigate on the Spanish Coast and in the English Channel and in 1758 saw service in the Seven Years' War, being present at the landing at Cancele. In that year he constructed a plan of the St. Cas Bay, and from then onwards seems to have lost no opportunity of putting to practical use such knowledge of surveying as he had obtained or could obtain.

In 1759 Rennell assisted in the capture of two valuable prizes off the south-west corner of England, and took leave to see his friends towards the end of that year. Whilst on leave it was arranged that he should go to India in the Norfolk, but on his way to join that vessel, he was wrecked in the Torrington. He missed the Norfolk, but eventually sailed for India in the America. On his way to Madras, he constructed plans of various harbours, and his intention, should he see no proper chance of advancement in the Navy, was to enter the Naval service of the East India Company.

134. In India:—On October 6th, 1760, Rennell served as a Volunteer at the cutting out of a large French Frigate and a merchantman anchored beneath the guns of Pondicherry, which was then under siege by the British. The losses during this hazardous performance were 8 killed and 30 wounded.

During November and December 1760 Rennell made a plan of the Trincomali Harbour, returning thence to Pondicherry where he narrowly escaped with his life during a hurricane which sank many companion vessels. He was present at Pondicherry until the fortress fell on January 17th, 1761; thence he proceeded to Bombay.

At this time an expedition left India to conquer Bourbon and Mauritius; Rennell went, but the expedition never matured; he was absent from India for some months, during which he executed plans of the Harbour of Port Maturin. March of 1762 saw him back at Madras.

About this time Rennell had hoped to be well in the running for his Lieutenancy in the Navy, but influence was insufficient, and he considered the question of joining the East India Company. He was not to join the Company's service, however, until he has been upon a long cruise in the direction of the Philipines, during which he was specially employed as a surveyor, making coast surveys and constructing charts. All that remains of his work on this cruise are five charts, all dated 1762:—

Bay of Carimorto, Nicobar Islands.

Quedah.

Sambalan Isles, Strait of Malacca.

Malacca.

Aboi Harbour, N. W. Borneo.

These charts engraved by Dalrymple were preserved in the India Office¹.

It is uncertain how long this eastern cruise lasted, but by April 1763 Rennell had returned to Madras, and his services on the cruise secured him the offer of the command of a small ship belonging to the East India Company. He had to refuse the offer, as his Captain was away, and his discharge from the Navy could not be arranged at short notice.

The Peace of Fontainebleau, which was signed on the 10th February 1763, resulted in Rennell being discharged from the Navy, as the large staff kept up during the Seven Years' War was reduced as soon as peace was established. In July of 1763 he was out of a job, but fortunately received

¹ They are now not traceable.

command of a ship of the East India Navy, on a pay of £300 per annum. But his luck had not really turned, for his ship was lost some three months later during a hurricane which sunk nearly all the vessels then at Madras. Rennell had the good fortune to be on shore at the time or he must have lost his life.

He was fortunate to obtain command of a small private vessel, the "Neptune," which was to be employed landing troops for the siege of Madras. This duty he carried out with credit, and during it managed to make surveys about Cap. Calimar and the Pamban Channel, and of the Palk Strait. Upon his return to Madras he received the thanks of Government and a substantial pecuniary reward.

135. Appointed Surveyor-General of Bengal.—He proceeded to Calcutta in the "Neptune"; there, through the influence of Topham, an old shipmate, who had left the Navy for the Company's service and had prospered greatly, he received a commission as Probationer Engineer at Fort William which was then under construction. He was also made Surveyor-General of Bengal at the same time through the influence of Captain Tinker under whom he had served in the Navy. Mr. LaTouche is of opinion that Rennell was not made Surveyor-General of Bengal until January 1st, 1767, and he bases this contention upon the opening words of Rennell's Journal for 1767, which read thus:—

"The 1st January 1767, I was appointed Surveyor-General."

Rennell, however, is quoted as having written himself that he received his appointment as Surveyor-General of the East India Company's dominions in Bengal, a few days before his commission in the Engineers.

Although the two statements by Rennell seem to be conflicting, they are not really so. The explanation is that Rennell became Surveyor-General of Bengal in April 1764, and Surveyor-General of India on 1st January 1767. This view is substantiated by the fact that Colonel Call, Rennell's successor in office, was Surveyor-General of India and not of Bengal.

Thus at the very early age of twenty-one Rennell received his chance, and it cannot be said that he did not make the best use of it.

The remnants of Rennell's work as a surveyor have been discussed already in this Memoir, but it is unfortunate that his actual movements are not known during the greater part of his career in Bengal. The diaries published by LaTouche give his career up to March 1767.

During that time he was employed upon the river surveys of Bengal. In February 1764 he was almost hopelessly wounded and partially crippled for life in an affair with Sunyasis in North Bengal.³ He recovered partially by June 1767, when he took the field again.

But in October 1765 he has received orders to produce a map of Bengal, and it seems probable that he spent less of his time in the field from 1767, by which year he had accumulated a great deal of extraneous material for his map. His diary shows that even before 1767 he has begun to rely upon Richards upon occasions when his health was bad, or when mapping work demanded great personal attention.

Markham gives the following dates for field work done by Rennell from 1767 onwards:—

1767-68.—Districts near the Brahmaputra and in Rangpur and Rangamati (Goalpara) and on the right bank of the Bhagirati. In Northern Bengal he had a near escape from an ambush.

1768-70.—Up the valley of the Brahmaputra to the east, where the nearly lost his life from an attack from a leopard, which he killed with his bayonet.

1771.—Commanded a force against an armed contingent of robbers in Northern Bengal, and dispersed the robbers. He marched three hundred and twenty miles in fifteen days.

¹ Page 41 of Markham's "Major James Rennell and the rise of Modern English Geography," 1895.

² See page 55 of Markham's Memoir on the Indian Surveys, 1875.

³ Markham gives a graphical description of this affair on pages 47—49 of his Life of Rennell. The date given for the fight, however, is misprinted as 1776. The fight occurred in February 1766, vide Rennell's Journal.

I cannot find where Sir Clements Markham got part of his information for the years 1767-70,¹ but cannot help thinking that it is not wholly correct.

136. His marriage and later life.—Rennell married Jane Thackeray on 15th October 1772 in Calcutta, and the union was a very happy one indeed. At the end of 1776, his labours being finished so far as collecting materials for the Bengal Atlas was concerned, he prepared to leave India, starting eventually from Calcutta in March 1777. After a stay in St. Helena, the family proceeded home in January 1778, and were very nearly lost at sea on the voyage to Portsmouth during a violent storm.

Eventually Rennell received a pension of £600 per annum.

His career from when he entered the Navy had been a very adventurous one. In addition to the dangers that have been described already, he passed through scurvy epidemics unscathed, and was much exposed to the dangers of the Bengal climate; a constant martyr to fever, he escaped from India only to suffer long illnesses in 1781 and 1782; but his constitution can hardly have been ruined, or he could not have lived till his 88th year.

137. Work after leaving India.—Rennell may be said to have become a geographer from when he arrived in England in 1778. From then, until his death in 1830, he worked more or less constantly, producing amongst others the following publications:—

1778.—“A description of the roads in Bengal and Behar, etc.”

1778.—First chart published, with a Memoir afterwards used in Purdy's navigation.

1779-80. First Edition of the Atlas of Bengal and Behar. (2nd Edition, 1781.)

1783.—Memoir of the Atlas of Bengal and Behar with details of the main water routes of Bengal, etc.

1788.—“Memoir of a Map of Hindustan.” (2nd Edition, 1792, 3rd Edition, 1793.)

1791.—“On the rate of travelling as performed by camels and its applications on a scale to the purposes of Geography.” From the “Philosophical Transactions” (with a map).

1792.—“The marches of the British Armies in the Peninsula of India during the campaigns of 1790 and 1791” (with a map).

1793.—“Observations on a Current that often prevails to the westward of Scilly endangering the safety of ships that approach the British Channel.” (Philosophical Transactions.)

1794.—A pamphlet entitled “War with France, the security of Britain.”

1800.—“Geography of Herodotus”—in two volumes, the first of which deals with North-Western Asia, and the second with Africa. A second edition published in 1830 by Lady Rodd.

1814.—A paper on the “Topography of Tyre.”

1816.—“Illustration (chiefly Geographical), of the History of the expedition of Cyrus, and the retreat of the ten thousand Greeks.”

1824.—A paper “On the voyage and place of shipwreck of St. Paul in A. D. 62.” (Society of Antiquaries.)

1824.—A paper “Concerning the identity of the architectural remains at Jerash, and whether they are those of Gerasa or Pelle.” (Society of Antiquaries.)

1826.—A paper concerning the place where Julius Caesar landed in Great Britain.

1827.—Winds and currents in 7 parts—I Eastern Division of the Atlantic—II Western Division of the Atlantic—III Southern Africa with the Legullas current—IV Currents between the Indian and South Atlantic Oceans—V The Gulf Stream—VI A General Index Chart—VIII Rennell's Current. (Actually published after Rennell's death.)

1831.—“A treatise on the comparative geography of Western Asia accompanied with an Atlas of maps” (2 volumes) published posthumously.

1839.—Remarks on the Topography of ancient Babylon (Society of Antiquaries). Published posthumously.

¹ Rennell finished work in that area in 1767. I do not think, therefore, that he went further up the Brahmaputra, as stated by Markham, after that year. Further, Rennell only shows the Brahmaputra in his Atlas to the point he reached in 1767.

Most of these works are described by Sir Clements Markham in his history of Rennell's life. There we also learn that Rennell, besides taking a deep interest in the subjects of his published works, was interested in politics and in Arctic exploration: he was a friend of Franklin and Parry. Geology also received attention from Rennell.

Rennell was created a Fellow of the Royal Society in 1781, receiving the Copley Medal of the Society ten years later. He was an honorary member of the African Association from 1788 onwards, and in 1790 constructed a map illustrating the existing knowledge of the northern half of that Continent.

Markham speaks of the Royal Geographical Society as his "Successor and Executor," it being formed shortly after Rennell's death.

Other honours conferred upon Rennell were Membership of the Institute of France, of the Imperial Academy of St. Petersburg, and of the Royal Society of Gottingen.

In Africa, a chain of mountains, off Scilly an ocean current, and in the Arctic a headland, bear Rennell's name.

It is significant to note that in India (so far as I am aware) we have no memorial to remind us of Rennell, and it is very wrong that this should be the case.

138. Rennell's death.—For years before he died, Rennell was a martyr to gout and but for the great love and care bestowed upon him by his daughter Lady Robt. might have lived a shorter time. When not crippled with gout he was at work upon one or other of the subjects of the publications given above. In December 1829, he broke his thigh, and remained a bed-ridden cripple until his death on the 28th March 1830, being in his 88th year.

His career seems to have been an extraordinary mixture of good and bad luck. The good luck he owed mainly to his own energy, genius and faculty for making staunch friends. The bad luck came in the form of rebuffs by fortune initially, in wounds, accident and sickness. But his indomitable spirit was always in evidence, until perhaps it was almost silenced by the breaking of his leg at such an advanced age. He died beloved by all who knew him, tended to the last by Lady Robt. He could not have been in better hands. But when time had done its work his country placed his remains in Westminster Abbey, where he was buried on the 6th of April 1830, and where "there is a tablet to his memory, with a bust, in the north-west angle of the nave."¹

¹ Page 222 of Markham's "Life of Rennell."

APPENDIX A.

Table of Contents of the New Atlas.

Ganges Series.

No. of Plate.	No. of parts to Plate.	Plate shows.	Scale.	Page in Memoir of 1917.
1	3	Jelengce to Damadur ...	500 yards to 1 inch ...	8
2	2	Damadur to Custee ...	Ditto ...	
3	3	Custee to Oddegjea ...	Ditto ...	
4	2	Oddegjea to Saatpour ...	Ditto ...	
5	3	Saatpour to Betturey ...	Ditto ...	9
6	2	Betturey to Saupour ...	Ditto ...	
7	2	Saupour to Hageagunge ...	Ditto ...	10
8	3	Hageagunge to Bromgunge ...	Ditto ...	
9	2	Bromgunge to Binetty ...	Ditto ...	
10	3	Binetty to Gozarya ...	Ditto ...	
11	2	Gozarya to Soynary ...	Ditto ...	11
12	2	Soynary to Chormodanya ...	Ditto ...	
13	1	Chormodanya to Mendygunge ...	Ditto ...	
14	1	Mendygunge to Lower Megna ...	Ditto ...	

Megna Series.

15	1	From Plate 14 to Doycalley ...	2 inches to 1 mile ...	12
16	2	Doycalley to Saddoukpour ...	Ditto ...	
17	2	Saddoukpour to Beerackondy ...	Ditto ...	
18	1	Beerackondy to Feringybazar on the Issainutty River ...	Ditto ...	13
19	1	Feringybazar to Dacca ...	Ditto ...	

Brahmaputra Series.

20	2	From Plate 18 to Nauldee Point ...	2 inches to 1 mile ...	14
21	1	From Plate 18 to Luckya River (northern exit from Brahmaputra) ...	2 miles to 1 inch ...	
22	1	Luckya River to Baganbarry ...	Ditto ...	15
23	1	Baganbarry to Chilmari ...	Ditto ...	
24	1	Chilmari to Rangamatty ...	Ditto ...	16
25	1	Rangamatti to Goalpara, etc. ...	Ditto ...	

Creek Series.

26	1	Custee Creek ...	200 yards to 1 inch ...	17
27	2	Maudapour Creek (Maleat to Serainpour) ...	500 " to 1 " ...	
28	1	Maudapour Creek (Serainpour to Burrashe River) ...	Ditto ...	18
29	1	Comer Creek (Mortapur to Cardya) ...	1 inch to 1 mile ...	
30	1	Comer Creek (Cardya to the Gauges) ...	Ditto ...	18
31	2	Comer Creek (Junction of the Burrashe and Burrasaat Creeks) ...	500 yards to 1 inch ...	
32	1	Comer Creek (Burrasaat Creek head to Luckeypour) ...	1 inch to 1 mile ...	19
33	1	Comer Creek (North-west branch) ...	2 inches to 1 " ...	
34	1	Chiddypour or Luricule Creek ...	1 inch to 1 " ...	20
35	1	Luckya River ...	3 miles to 1 " ...	
36	1	Bally Creek ...	500 feet to 1 inch ...	

Special Small Scale Maps.

37	1	Map of Inland navigation ...	50 miles to 1 inch ...	20
38	1	Road map of Bengal (Plates 37, and 38 are shown on one page of the New Atlas) ...	75 " to 1 " ...	

Complete Maps of Old Bengal.

No. of Plate.	No. of parts to Plate.	Plate shows.	Scale.	Page in Memoir of 1917.
39	2	North Bihar	5 miles to 1 inch ...	21
40	1	South-West Bihar	Ditto ...	
41	2	South-East Bihar	Ditto ...	22
42	1	Purnea, Sonthal Perganas and Malda ...	Ditto ...	
43	1	North Central Bengal (Dinajpur, etc.) ...	Ditto ...	23
44	2	Rangpur, Cooch Bihar and Goulpara ...	Ditto ...	
45	2	Sylhet, Dacca, etc.	Ditto ...	24
46	2	South Dacca, Tippera, etc. ...	Ditto ...	
47	2	Chittagong	3 miles to 1 inch ...	25
48	1	Sunderbans navigation map ...	5 miles to 1 inch ...	
49	2	Nadia Rivers and South Padda areas ...	Ditto ...	27
50	1	Mid-Bengal	Ditto ...	
51	1	Birbhum and neighbourhood (Mid-Western Bengal)	5 miles to 1 inch ...	28
52	2	Calcutta and country west, south and north of that city ...	Ditto ...	
53	2	North-west Chota Nagpur ...	10 miles to 1 inch ...	29
54	1	Bhagalpur, Moughyr, etc. ...	5 miles to 1 inch ...	
55	1	Low lands of Mid-Bengal (Chalan Bhil, etc.)	Ditto ...	30
56	1	Country between Sangrai and Oolbaria	2 inches to 1 mile ...	
57	1	Country 40 miles round Dacca ...	2 miles to 1 inch ...	31
58	1			

NOTE.—The scales given are not always quite accurate. Before accepting a scale as final the Memoir should be consulted.

